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Faggiano F, Minozzi S, Versino E, Buscemi D

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## [Intervention Review]

# Universal school-based prevention for illicit drug use

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## ABSTRACT

### Background

Drug addiction is a chronic, relapsing disease. Primary interventions should aim to reduce first use or to prevent the transition from experimental use to addiction. School is the appropriate setting for preventive interventions.

### Objectives

To evaluate the effectiveness of universal school-based interventions in reducing drug use compared to usual curricular activities or no intervention.

### Search methods

We searched the Cochrane Drugs and Alcohol Group's Trials Register (September 2013), the Cochrane Central Register of Controlled Trials (2013, Issue 9), PubMed (1966 to September 2013), EMBASE (1988 to September 2013) and other databases. We also contacted researchers in the field and checked reference lists of articles.

### Selection criteria

Randomised controlled trials (RCT) evaluating school-based interventions designed to prevent illicit drugs use.

### Data collection and analysis

We used the standard methodological procedures expected by The Cochrane Collaboration.

### Main results

We included 51 studies, with 127,146 participants. Programmes were mainly delivered in sixth and seventh grade pupils. Most of the trials were conducted in the USA.

#### Social competence approach versus usual curricula or no intervention

Marijuana use at < 12 months follow-up: the results favoured the social competence intervention (risk ratio (RR) 0.90; 95% confidence interval (CI) 0.81 to 1.01, four studies, 9456 participants, moderate quality evidence). Seven studies assessed this outcome (no data for meta-analysis): two showed a positive significant effect of intervention, three showed a non-significant effect, one found a significant effect in favour of the control group and one found a trend in favour of the control group.

Marijuana use at 12+ months: the results favoured the social competence intervention (RR 0.86; 95% CI 0.74 to 1.00, one study, 2678 participants, high quality evidence). Seven studies assessed this outcome (no data for meta-analysis): two showed a significant positive

effect of intervention, three showed a non-significant effect, one found a significant effect in favour of the control group and one a trend in favour of the control group.

Hard drug use at < 12 months: we found no difference (RR 0.69; 95% CI 0.40 to 1.18, one study, 2090 participants, moderate quality evidence). Two studies assessed this outcome (no data for meta-analysis): one showed comparable results for the intervention and control group; one found a statistically non-significant trend in favour of the social competence approach.

Hard drug use at 12+ months: we found no difference (mean difference (MD) -0.01; 95% CI -0.06 to 0.04), one study, 1075 participants, high quality evidence). One study with no data for meta-analysis showed comparable results for the intervention and control group.

Any drug use at < 12 months: the results favoured social competence interventions (RR 0.27; 95% CI 0.14 to 0.51, two studies, 2512 participants, moderate quality evidence). One study with 1566 participants provided continuous data showing no difference (MD 0.02; 95% CI -0.05 to 0.09, moderate quality evidence).

#### Social influence approach versus usual curricula or no intervention

Marijuana use at < 12 months: we found a nearly statistically significant effect in favour of the social influence approach (RR 0.88; 95% CI 0.72 to 1.07, three studies, 10,716 participants, moderate quality evidence). One study with 764 participants provided continuous data showing results that favoured the social influence intervention (MD -0.26; 95% CI -0.48 to -0.04).

Marijuana use at 12+ months: we found no difference (RR 0.95; 95% CI 0.81 to 1.13, one study, 5862 participants, moderate quality evidence). One study with 764 participants provided continuous data and showed nearly statistically significant results in favour of the social influence intervention (MD -0.22; 95% CI -0.46 to 0.02). Of the four studies not providing data for meta-analysis a statistically significant protective effect was only found by one study.

Hard drug use at 12+ months: one study not providing data for meta-analysis found a significant protective effect of the social influence approach.

Any drug use: no studies assessed this outcome.

#### Combined approach versus usual curricula or no intervention

Marijuana use at < 12 months: there was a trend in favour of intervention (RR 0.79; 95% CI 0.59 to 1.05, three studies, 8701 participants, moderate quality evidence). One study with 693 participants provided continuous data and showed no difference (MD -1.90; 95% CI -5.83 to 2.03).

Marijuana use at 12+ months: the results favoured combined intervention (RR 0.83; 95% CI 0.69 to 0.99, six studies, 26,910 participants, moderate quality evidence). One study with 690 participants provided continuous data and showed no difference (MD -0.80; 95% CI -4.39 to 2.79). Two studies not providing data for meta-analysis did not find a significant effect.

Hard drug use at < 12 months: one study with 693 participants provided both dichotomous and continuous data and showed conflicting results: no difference for dichotomous outcomes (RR 0.85; 95% CI 0.63 to 1.14), but results in favour of the combined intervention for the continuous outcome (MD -3.10; 95% CI -5.90 to -0.30). The quality of evidence was high.

Hard drug use at 12+ months: we found no difference (RR 0.86; 95% CI 0.39 to 1.90, two studies, 1066 participants, high quality evidence). One study with 690 participants provided continuous data and showed no difference (MD 0.30; 95% CI -1.36 to 1.96). Two studies not providing data for meta-analysis showed a significant effect of treatment.

Any drug use at < 12 months: the results favoured combined intervention (RR 0.76; 95% CI 0.64 to 0.89, one study, 6362 participants).

Only one study assessed the effect of a knowledge-focused intervention on drug use and found no effect. The types of comparisons and the programmes assessed in the other two groups of studies were very heterogeneous and difficult to synthesise.

#### **Authors' conclusions**

School programmes based on a combination of social competence and social influence approaches showed, on average, small but consistent protective effects in preventing drug use, even if some outcomes did not show statistical significance. Some programmes based on the social competence approach also showed protective effects for some outcomes.

Since the effects of school-based programmes are small, they should form part of more comprehensive strategies for drug use prevention in order to achieve a population-level impact.

## **PLAIN LANGUAGE SUMMARY**

### **School-based prevention for illicit drug use**

## Background

Drug addiction is a long-term problem caused by an uncontrollable compulsion to seek drugs. It is a serious and growing problem. This makes it important to reduce the number of young people first using drugs, and to prevent the transition from experimental use to addiction. Schools offer the most systematic and efficient way of reaching them.

School programmes are categorised into four main groups:

1. Knowledge-focused curricula (courses of study) give information about drugs, assuming that information alone will lead to changes in behaviour.
2. Social competence curricula are based on the belief that children learn drug use by modelling, imitation and reinforcement, influenced by the child's pro-drug cognitions (perceptions), attitudes and skills. These programmes use instruction, demonstration, rehearsal, feedback and reinforcement, etc. They teach generic self management personal and social skills, such as goal-setting, problem-solving and decision-making, as well as cognitive skills to resist media and interpersonal influences, to enhance self esteem, to cope with stress and anxiety, to increase assertiveness and to interact with others.
3. Social norms approaches use normative education methods and anti-drugs resistance skills training. These include correcting adolescents' overestimates of the drug use rates of adults and adolescents, recognising high-risk situations, increasing awareness of media, peer and family influences, and teaching and practising refusal skills.
4. Combined methods draw on knowledge-focused, social competence and social influence approaches together.

## Review question

We reviewed the evidence about the effect of school-based prevention interventions on reducing the use and intention to use drugs and increasing knowledge about the harms of drugs in primary or secondary school pupils.

## Study characteristics

We found a total of 51 studies (73 reports) with 127,146 participants involved. Twenty-seven studies compared 28 programmes adopting a social competence approach versus usual curricula, eight studies compared a social influence approach versus usual curricula, seven studies compared a combined approach versus usual curricula, two studies compared a programme based on knowledge only versus usual curricula, four studies compared other approaches versus usual curricula, seven studies assessed 11 different comparisons. They were mainly delivered in sixth and seven grade pupils (12 to 13 years). Most of the trials were conducted in the USA. The interventions were mainly interactive and five of them lasted one school year, 18 more than one school year and 29 less than one school year. In all other cases the duration was not clearly specified. Follow-up ranged from immediately after the end of the intervention up to 10 years.

## Key results

Programmes based on social competence were mostly represented and showed a similar tendency to reduce the use of substances and the intention to use, and to improve knowledge about drugs, compared to usual curricula, but the effects were seldom statistically significant. Programmes based on social influence showed weak effects that were rarely significant. Programmes based on a combination of social competence and social influence approaches seemed to have better results than the other categories, with effective results in preventing marijuana use at longer follow-up, and in preventing any drug use. Knowledge-based interventions showed no differences in outcomes, apart from knowledge, which was improved among participants involved in the programme.

## Quality of the evidence

The quality of evidence was moderate for some outcomes and comparisons, and was high for others. Most of the studies did not report adequately the way in which the study was conducted. Moreover, many studies did not report their results in a way that allowed them to be combined in a statistical summary.

The evidence is current to September 2013.

## SUMMARY OF FINDINGS

### Summary of findings for the main comparison. Social competence versus usual curricula for illicit drug use

#### Social competence versus usual curricula for illicit drug use

**Patients or population:** primary or secondary school pupils

**Settings:** schools

**Intervention:** social competence versus usual curricula

Outcomes	Illustrative comparative risks* (95% CI)		Relative ef- fect (95% CI)	No of partici- pants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Usual curricula	Social competence				
Marijuana use < 12 months Subjective	Study population		RR 0.9 (0.81 to 1.01)	9456 (4 studies)	⊕⊕⊕⊖ moderate <sup>1</sup>	
	119 per 1000	107 per 1000 (96 to 120)				
	Moderate					
	121 per 1000	109 per 1000 (98 to 122)				
Marijuana use ≥ 12 months Subjective	Study population		RR 0.86 (0.74 to 1)	2678 (1 study)	⊕⊕⊕⊕ high	
	217 per 1000	186 per 1000 (160 to 217)				
	Moderate					
	217 per 1000	187 per 1000 (161 to 217)				
Hard drug use < 12 months Subjective	Study population		RR 0.69 (0.4 to 1.18)	2090 (1 study)	⊕⊕⊕⊖ moderate <sup>2</sup>	
	30 per 1000	20 per 1000 (12 to 35)				
	Moderate					
	30 per 1000	21 per 1000				

	(12 to 35)			
<b>Hard drugs use ≥ 12 months</b> Subjective	mean drug use 0.19 (SD 0.44)	The mean hard drug use at ≥ 12 months in the intervention groups was <b>0.01 lower</b> (0.06 lower to 0.04 higher)	1075 (1 study)	⊕⊕⊕⊕ <b>high</b>
<b>Any drug use &lt; 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.27</b> (0.14 to 0.51)	2512 (2 studies) <b>⊕⊕⊕⊖</b> <b>moderate</b> <sup>3</sup>
	<b>31 per 1000</b>	<b>8 per 1000</b> (4 to 16)		
	<b>Moderate</b>			
	<b>27 per 1000</b>	<b>7 per 1000</b> (4 to 14)		
<b>Any drug use &lt; 12 months</b> Subjective	mean drug use 0.28 (SD 0.56)	The mean any drug use < 12 months in the intervention groups was <b>0.02 higher</b> (0.05 lower to 0.09 higher)	1566 (1 study)	⊕⊕⊕⊖ <b>moderate</b> <sup>3</sup>

\*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

**CI:** confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence

**High quality:** Further research is very unlikely to change our confidence in the estimate of effect.

**Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Very low quality:** We are very uncertain about the estimate.

<sup>1</sup>One study at high risk of detection bias, one study at high risk of attrition bias.

<sup>2</sup>High risk of attrition bias.

<sup>3</sup>One study at high risk of attrition bias.

## Summary of findings 2. Social influence versus usual curricula for illicit drug use

### Social influence versus usual curricula for illicit drug use

**Patients or population:** primary or secondary school pupils

**Settings:** schools

**Intervention:** social influence versus usual curricula



Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Usual curricula	Social influence				
<b>Marijuana use &lt; 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.88</b> (0.72 to 1.07)	10716 (3 studies)	⊕⊕⊕⊖ <b>moderate</b> <sup>1</sup>	
	<b>100 per 1000</b>	<b>88 per 1000</b> (72 to 108)				
	<b>Moderate</b>					
	<b>170 per 1000</b>	<b>150 per 1000</b> (122 to 182)				
<b>Marijuana use ≥ 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.95</b> (0.81 to 1.13)	5862 (1 study)	⊕⊕⊕⊖ <b>moderate</b> <sup>2</sup>	
	<b>90 per 1000</b>	<b>85 per 1000</b> (73 to 102)				
	<b>Moderate</b>					
	<b>90 per 1000</b>	<b>86 per 1000</b> (73 to 102)				

\*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

**CI:** confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence

**High quality:** Further research is very unlikely to change our confidence in the estimate of effect.

**Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Very low quality:** We are very uncertain about the estimate.

<sup>1</sup>One study at high risk of selection bias, one at high risk of detection bias.

<sup>2</sup>High risk of selection bias.

### Summary of findings 3. Combined programmes versus usual curricula for illicit drug use

**Combined programmes versus usual curricula for illicit drug use**

**Patients or population:** primary or secondary school pupils  
**Settings:** schools  
**Intervention:** combined versus usual curricula

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control	Combined versus usual curricula				
<b>Marijuana use &lt; 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.79</b> (0.59 to 1.05)	8701 (3 studies)	⊕⊕⊕⊖ <b>moderate</b> <sup>1</sup>	
	<b>90 per 1000</b>	<b>71 per 1000</b> (53 to 94)				
	<b>Moderate</b>					
	<b>73 per 1000</b>	<b>58 per 1000</b> (43 to 77)				
<b>Marijuana use ≥12 months</b> Subjective	<b>Study population</b>		<b>RR 0.83</b> (0.69 to 0.99)	26910 (6 studies)	⊕⊕⊕⊖ <b>moderate</b> <sup>1</sup>	
	<b>168 per 1000</b>	<b>139 per 1000</b> (116 to 166)				
	<b>Moderate</b>					
	<b>210 per 1000</b>	<b>174 per 1000</b> (145 to 208)				
<b>Hard drug use &lt; 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.85</b> (0.63 to 1.14)	693 (1 study)	⊕⊕⊕⊕ <b>high</b>	
	<b>217 per 1000</b>	<b>184 per 1000</b> (137 to 247)				
	<b>Moderate</b>					
	<b>217 per 1000</b>	<b>184 per 1000</b> (137 to 247)				
<b>Hard drugs use ≥12 months</b> Subjective	<b>Study population</b>		<b>RR 0.86</b> (0.39 to 1.9)	1066 (2 studies)	⊕⊕⊕⊕ <b>high</b>	
	<b>118 per 1000</b>	<b>101 per 1000</b>				

		(46 to 223)			
	<b>Moderate</b>				
	<b>110 per 1000</b>	<b>95 per 1000</b> (43 to 209)			
<b>Any drugs use &lt; 12 months</b> Subjective	<b>Study population</b>		<b>RR 0.76</b> (0.64 to 0.89)	6362 (1 study)	⊕⊕⊕⊕ <b>high</b>
	<b>93 per 1000</b>	<b>70 per 1000</b> (59 to 83)			
	<b>Moderate</b>				
	<b>93 per 1000</b>	<b>71 per 1000</b> (60 to 83)			

\*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

**CI:** confidence interval; **RR:** risk ratio

GRADE Working Group grades of evidence

**High quality:** Further research is very unlikely to change our confidence in the estimate of effect.

**Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Very low quality:** We are very uncertain about the estimate.

<sup>1</sup>One study at high risk of attrition bias.

## BACKGROUND

Several studies have demonstrated that adolescent substance abuse is a serious and growing problem (Altobelli 2005).

In Europe, lifetime prevalence of use among young adults (15 to 34 years old) is estimated to be 32.5% for cannabis, 6.3% for cocaine, 5.5% for amphetamines and 5.7% for ecstasy (EMCDDA 2012). Among 15 to 16-year old students, 21% of boys and 15% of girls have tried illicit drugs, mainly cannabis, at least once during their lifetime. Lifetime prevalence of ecstasy use ranges from 2% to 3%, use of cocaine ranges from 1% to 2%, amphetamine use ranges from 1% to 8% and cannabis use ranges from 11% to 19% (ESPAD 2011).

In seven Latin American countries, school surveys of adolescents found that an estimated 5% of youths had tried drugs (Dortmizer 2004).

In the USA, the most recent household survey data reported that current drug use was 9.5% among 12 to 17-year olds and 21.3% among 18 to 25 year-old youths (SAMHSA 2012). In 2012, 9.5% of youths aged 12 to 17 were current illicit drug users: 7.2% used marijuana, 2.8% were engaged in non-medical use of prescription drugs, 0.8% used inhalants, 0.6% used hallucinogens and 0.1% used cocaine. Rates of current use of illicit drugs in 2012 were higher for young adults aged 18 to 25 (21.3%) than for youths aged 12 to 17 (9.5%) and adults aged 26 or older (7.0%). Among young adults, 18.7% had used marijuana in the past month, 5.3% had used prescription drugs non-medically, 1.7% had used hallucinogens and 1.1% had used cocaine. Of the 2.4 million recent marijuana initiates, 57.3% were younger than 18. For cocaine, the average age at first use among recent initiates aged 12 to 49 was 20 years. Among past year initiates aged 12 to 49, the average age at initiation of ecstasy in 2012 was 20.3 years (SAMHSA 2012). The annual prevalence of use of heroin and other opioids among adolescents fluctuated in the USA between 0.7% and 0.6% from 2005 through 2012 (Johnston 2013). The annual prevalence of recreational use of controlled-release oxycodone (Oxy-Contin) was 1.6%, 3.0% and 4.3% in grades 8, 10 and 12, respectively (14, 16 and 18-year old students). For hydrocodone and acetaminophen (Vicodin), in 2012 the annual prevalence rates were 1.3%, 4.4% and 7.5% in grades 8, 10 and 12 respectively (Johnston 2013).

In Australia in 2010, 39.8% of people aged 14 years or older had used any illicit drug in their lifetime: 35.4% had used cannabis, 10.3% had used ecstasy, 8.8% had used hallucinogens, 7.3% had used cocaine and 7.0% had used amphetamines (AIHW 2011).

### Description of the condition

Drug addiction (see the Cochrane Drugs and Alcohol Group (CDAG) module, Amato 2007) is commonly described both medically and socially as a chronic, relapsing disease, characterised by the effects of the prolonged use of the drug itself and by the behavioural disorder due to its compulsive seeking (Leshner 1997).

Drug users are commonly divided into 'sensation seekers' and those who use drugs as a way to deal with life's problems or with dysphoric mood. Not all users become addicted. Once established, however, addiction "is often an uncontrollable compulsion to seek and use drugs" (Leshner 1999). Experimental use affects mainly adolescents, who "use drugs simply for the pleasant feelings or

the euphoria that drugs can produce, or to feel accepted by their peers" (Leshner 1999). Since the neurological or psychological factors affecting the risk of addiction are not known, "even occasional drug use can inadvertently lead to addiction" (Leshner 1997; Leshner 1999). The natural history of addiction has been written in terms of a "gateway theory" or "stepping-stone hypothesis", so that involvement in drug use may follow culturally determined steps. Hard liquors and tobacco, for example, are viewed as intermediate between beer/wine and marijuana, while marijuana is a stepping stone to other illicit drugs (Fergusson 2000; Kandel 1975). This theory, however, is not universally accepted (Morral 2002). More recently, the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) included drug dependence among substance abuse disorders, characterised by a compulsive, out-of-control use of substances, despite negative consequences (DSM-5). Whichever model of explanation is considered, primary interventions should aim to reduce first use, or prevent the transition from experimental use to addiction.

Drug dependence is a complex problem, the understanding of which requires a deep knowledge of determinants of behavioural disturbances in a given context (Green 1991). The absence of a sufficiently clear picture of the dynamics and determinants of initial drug abuse, however, hinders the implementation of effective prevention programmes. Application of evidence-based thinking to primary prevention is in fact hampered by the complexity of the causal chain. This chain comprises two significant links: the first is the relationship between risk factors and the problem to be prevented (e.g. the role of tobacco smoking in the causation of lung cancer); the second is the relationship between the preventive intervention and reduction of the risky behaviour (e.g. the effectiveness of the preventive programme in reducing the number of young persons who start to smoke). The knowledge about the first link is uncertain, however social and psychological factors, susceptibility, information about hazards and many other factors are involved. The weakness of the theories about the origins of drug addiction is partially due to the difficulty of studying such factors.

### Description of the intervention

Schools are an appropriate setting for illicit drug use prevention programmes for three reasons. First, four out of five tobacco smokers begin before adulthood. Prevention of substance use must thus focus on school-aged children and adolescents, before their beliefs and expectations about substance use are established. Second, schools offer the most systematic and efficient way of reaching a substantial number of young persons every year. Third, in most countries schools can adopt and enforce a broad spectrum of educational policies.

Most programmes, therefore, are school-based. Different approaches are employed: as suggested by Nancy Tobler, programmes can be divided into those founded on: (1) knowledge-only interventions, where description of the biological and psychological effects of drug use aim to build negative attitudes toward drugs and hence decrease their use; (2) affective-only, e.g. self esteem or self awareness building interventions, based on the assumption that psychological factors place people at risk of use; (3) peer-based interventions, namely refusal skills and social life skills programmes, the former focused on resistance skills or 'say no' techniques or peer role models and the latter

on inter-personal skills (communication, modelling, etc) or intra-personal skills (affective education), both being founded on the assumption that peer pressure can lead to drug use; (4) knowledge plus affective interventions, in which knowledge is combined with affective education to provide values and build decision-making patterns; (5) alternative approaches (activities and competence), such as interventions encouraging alternative activities to drug use or those aimed at enforcing control abilities (Tobler 1986).

A more recent classification proposes dividing the interventions as follows (Thomas 2006):

- Knowledge-focused curricula present participants with information about smoking including health risks of tobacco use, and the prevalence and incidence of smoking assuming that information alone will lead to changes in behaviour.
- Social competence curricula use enhancement interventions (also called affective education), based on Bandura's social learning theory (Bandura 1977). This model hypothesises that children learn drug use by modelling, imitation and reinforcement, influenced by the child's pro-drug cognitions, attitudes and skills. Susceptibility is increased by poor personal and social skills and a poor personal self concept (Botvin 2000). These programmes use cognitive-behavioural skills (instruction, demonstration, rehearsal, feedback, reinforcement, and out-of-class practice in homework and assignments). They teach generic self management personal and social skills, such as goal-setting, problem-solving and decision-making, and also teach cognitive skills to resist media and interpersonal influences, to enhance self esteem, to cope with stress and anxiety, to increase assertiveness and to interact with others.
- Social norms approaches, based on McGuire's persuasive communications theory (McGuire 1968), and Evans's theory of psychological inoculation (Evans 1976), use normative education methods and anti-drugs resistance skills training. These include correcting adolescents' overestimates of the drug use rates of adults and adolescents, recognising high-risk situations, increasing awareness of media, peer and family influences, and teaching and practising refusal skills. They often apply the techniques of generic competence enhancement to specific anti-drug goals.
- Combined methods draw on knowledge-focused, social competence and social influence approaches.

### How the intervention might work

Knowledge-focused interventions are based on the assumption that a deficiency of knowledge regarding the risk and the danger of substance use is the cause of use and abuse, and that increasing knowledge should influence and lead to a change in attitudes toward drugs (from positive to negative) and consequently influence behaviour.

Social competence approaches are based on the assumption that youth with poor personal and social skills (poor self esteem, low assertiveness, poor behavioural self control, difficulties in coping with anxiety and stress) are more susceptible to influences that promote drugs (Griffin 2010). These interventions teach general problem-solving and decision-making skills, skills for increasing self control and self esteem, adaptive coping strategies for relieving stress and anxiety, and general social, communication and assertive skills.

Social norms approaches are based on the assumption that substance use is a consequence of an inaccurate perception and overestimate of substance use among peers. This overestimate can lead to the perception that substance use is a normative behaviour, which could increase social acceptability among peers. This kind of intervention also teach strategies to recognise and resist peer and media pressures, like for example resistance skills training and 'say no' techniques (Griffin 2010).

### Why it is important to do this review

Many studies have evaluated the efficacy of drug use prevention programmes. Most are randomised controlled trials, varying in quality. Few of the non-randomised studies are of high quality and their usefulness is questioned (MacMahon 2001). Some authors suggest their inclusion in systematic reviews, provided they meet a high standard of quality.

The evidence, mainly in the form of qualitative results, has been summarised on several occasions (Hansen 1992; Kroger 1994; White 1997; White 1998). The most significant reviews are those by Tobler (Tobler 1997; Tobler 2000), who adopted Glass's meta-analysis technique for social studies (Glass 1981).

None of these reviews undertook comprehensive assessment of the quality of study design, the types of intervention, the different outcomes, the length of follow-up and the other features needed to establish which form of intervention is the most effective.

The paper therefore presents a systematic review of studies that evaluate the effectiveness of school-based interventions to curb illicit drug use.

### OBJECTIVES

- To evaluate the effectiveness of universal school-based interventions in reducing drug use compared to usual curricular activities or no intervention.

### METHODS

#### Criteria for considering studies for this review

##### Types of studies

Randomised controlled trials (RCTs) and controlled clinical trials (CCTs) reporting the evaluation of any intervention programme targeting individuals or groups versus a control condition (usual curricular activities or another school-based drug prevention programme) and designed to prevent substance use in a school setting.

##### Types of participants

Primary or secondary school pupils are the target population. We excluded studies targeting special populations.

##### Types of interventions

##### Experimental intervention

School-based primary prevention interventions, classified in terms of their:

- educational approaches (knowledge-focused, social competence-focused and social norms-focused programmes, combined programmes, other types of interventions);
- targeted substances (we included programmes addressing all substances including alcohol, but only extracted outcomes related to illicit substance use);
- type of setting (we excluded interventions combining school-based programmes with extra school programmes).

### Control intervention

- Usual curricular activities.
- Different school-based intervention.

### Types of outcome measures

For all the outcomes considered, when possible we dichotomised the results into:

- less than 12 months follow-up; and
- equal to or more than 12 months follow-up.

### Primary outcomes

- Use of drugs (self reported, specific tests)
  - \* Marijuana
  - \* Hard drugs (heroin, cocaine, crack)
  - \* Other drugs
  - \* Any drug

### Secondary outcomes

- Knowledge about the harms of drugs (self reported, specific tests)
- Intention to use drugs (self reported, specific tests)
  - \* Marijuana
  - \* Hard drugs (heroin, cocaine, crack)
  - \* Other drugs
  - \* Any drug

Since the main adverse effect reported in primary prevention activities is an increase in drug use, and we have analysed this as a main effect of the included interventions; we studied no specific adverse effects.

## Search methods for identification of studies

### Electronic searches

We searched the following sources:

- Cochrane Drugs and Alcohol Group (CDAG) Trials Register (September 2013);
- Cochrane Central Register of Controlled Trials (CENTRAL 2013, Issue 9);
- MEDLINE (PubMed) (from 1966 to September 2013);
- EMBASE (embase.com) (from 1988 to September 2013);
- ERIC (1988 to April 2012);
- Sociological Abstracts (1963 to April 2012);
- PsycINFO (OVID 1967 to September 2013);
- ACP Journal Club (OVID 1991 to February 2004);
- Cochrane Methodology Register (*The Cochrane Library* 2013, Issue 9);

- Database of Abstracts of Reviews of Effects (DARE) (*The Cochrane Library* 2013, Issue 9);
- Health Technology Assessment Database (*The Cochrane Library* 2013, Issue 9);
- NHS Economic Evaluation Database (*The Cochrane Library* 2013, Issue 9).

The search strategies for the CDAG Specialised Register, CENTRAL, MEDLINE, EMBASE, PsycINFO, ERIC and Sociological Abstracts can be found in [Appendix 1](#), [Appendix 2](#), [Appendix 3](#), [Appendix 4](#), [Appendix 5](#), [Appendix 6](#) and [Appendix 7](#) respectively. We combined the PubMed search for MEDLINE with the Cochrane Highly Sensitive Search Strategy for identifying randomised trials in MEDLINE: sensitivity- and precision-maximising version (2008 revision) (Lefebvre 2011). We translated the PubMed search strategy into the other databases using the appropriate controlled vocabulary as applicable. There were no language restrictions.

We also searched some of the main electronic sources of ongoing trials:

- Current Controlled Trials ([www.controlled-trials.com/](http://www.controlled-trials.com/));
- Clinical Trials.gov ([www.clinicaltrials.gov/](http://www.clinicaltrials.gov/));
- International Clinical Trials Registry Platform (ICTRP) ([www.who.int/ictip/en](http://www.who.int/ictip/en)).

In addition, we searched the following grey literature databases:

- Canadian Research Institute;
- Center for Adolescent Substance Abuse Research;
- Dissertations and Theses Database;
- EdResearch Online;
- EPPI-Centre database of health promotion research;
- The Campbell Collaboration Library of Systematic Reviews.

### Searching other resources

We scanned review articles, as well as all the included and excluded paper citations, to identify other relevant studies. We reviewed relevant editorials, commentaries and letters to identify other useful bibliographic details. We contacted other research and review teams, and 21 authors of the included studies, in accordance with the procedures suggested by The Cochrane Collaboration, to identify other potentially relevant studies. Six authors sent published and unpublished references or papers.

## Data collection and analysis

### Selection of studies

Two review authors (FVT, FF for the first version of the review; EV, FF for the current one) inspected the search hits by reading titles and abstracts. We obtained each potentially relevant study located in the search in full text and two review authors (FVT, FF for the first version of the review; EV, FF for the current one) independently assessed these for inclusion. We resolved doubts by discussion between the authors.

### Data extraction and management

Three review authors (FVT, EV, FF for the first version of the review; SM, EV, DB for the current one) independently extracted the data from the documents using a standardised checklist. We dealt with disagreement by consultation between all authors.



We contacted 21 authors by email in order to provide supplementary information, and to inquire about studies included in the [Studies awaiting classification](#) section of the first version of the review. Twelve of them replied and seven provided the requested data, allowing the integration of the studies into the analysis.

According to the content of the programme, we classified the intervention and control arms into the following groups.

- Knowledge-focused curricula.
- Social competence curricula.
- Social influence curricula.
- Combined interventions with knowledge-focused, social competence and social influence approaches.
- Others.

We extracted the following information from each study.

- Programme name.
- Programme duration (in months).
- Number of sessions.
- Presence of a booster session (yes/no).
- Programme deliverer (teacher, project staff, peer).
- Interactive/passive modality.
- Length of follow-up (in months).
- Time of outcome assessment (less than 12 months since the end of the intervention/12+ months).
- Types of outcomes assessed (use of any drug, use of marijuana, use of hard drugs, intention to use, knowledge).
- Data suitable for meta-analysis (yes/no).

### Assessment of risk of bias in included studies

One author (SM) performed the 'Risk of bias' assessment for RCTs and CCTs and a second author (FF) checked this using the criteria recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). The trial [UNPLUGGED 2008](#) presented a conflict of interest issue because one author of the trial is also an author of the present review. This study was assessed by SM and verified by EV. The recommended approach for assessing risk of bias in studies included in a Cochrane review is a two-part tool, addressing seven specific domains, namely sequence generation and allocation concealment (selection bias), blinding of participants and providers (performance bias), blinding of outcome assessor (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias) and other source of bias. The first part of the tool involves describing what was reported to have happened in the study. The second part of the tool involves assigning a judgement relating to the risk of bias for that entry, in terms of low, high or unclear risk. To make these judgements we used the criteria indicated by the *Cochrane Handbook for Systematic Reviews of Interventions*, adapted to the addiction field. See [Appendix 8](#) for details.

We addressed the domains of sequence generation and allocation concealment (selection bias) in the tool by a single entry for each study.

Blinding of participants and personnel was not possible for the kind of intervention. We assessed blinding of outcome assessor

(avoidance of detection bias) only for subjective outcomes (e.g. knowledge, intention to use, use of drugs) because all the outcome assessments are based on self reported data.

We considered incomplete outcome data (avoidance of attrition bias) for all outcomes except for drop-out from treatment, which is very often the primary outcome measure in trials on addiction.

### Measures of treatment effect

We calculated a standardised effect size for each study, based on the absolute numbers of reported outcomes. For dichotomous outcomes we calculated risk ratios and 95% confidence intervals. For continuous outcomes we calculated standardised mean difference (SMD) between groups and 95% confidence intervals to summarise results across studies with outcomes measured in different ways.

### Unit of analysis issues

School-based studies have to confront the problem of intra class variability due to the clustering of the subject under study. Since several studies did not perform any cluster adjustment in the analysis, and in order to include in the meta-analysis as many studies as possible, we extracted only the crude data from articles. This would probably produce an overestimation of the precision of the results, and we took it into account in the [Discussion](#) section.

### Assessment of heterogeneity

We performed a test of heterogeneity when two or more studies were included in the meta-analysis. We assessed statistically significant heterogeneity among primary outcome studies with the  $\chi^2$  test and  $I^2$  statistic (Higgins 2011). We considered a significant  $\chi^2$  (P value < 0.01) and an  $I^2$  value of at least 50% as statistical heterogeneity.

### Assessment of reporting biases

We planned assessment of publication bias but did not perform this because the number of included trials in each meta-analysis never reached the minimum number needed (10).

### Data synthesis

We combined the outcome measures from the individual trials through meta-analysis, when possible (clinical comparability of intervention and outcomes among trials), using a random-effects model because a certain degree of heterogeneity was expected between the interventions and the participants of the included studies. For the studies not providing data suitable for meta-analysis, we built additional tables to provide a summary of results ([Table 1](#); [Table 2](#); [Table 3](#); [Table 4](#); [Table 5](#); [Table 6](#)). We then integrated results from the meta-analysis and summary tables into the discussion.

### Subgroup analysis and investigation of heterogeneity

We planned the following subgroup analyses:

- teaching modality (interactive versus passive);
- deliverers (school teacher, external educators, peers);
- booster (yes, no).

However, because the number of studies making these analysis in each type of comparison was too small, we performed no subgroup analyses.

### **Sensitivity analysis**

To incorporate 'Risk of bias' assessment in the review process we planned first to plot the intervention effect estimates for different outcomes stratified for risk of bias. If differences in results were present among studies at different risks of bias, we planned to perform sensitivity analysis by excluding from the analysis studies with high risk of bias. We also planned to perform subgroup analysis for studies with low and unclear risk of bias. Few studies were

included in the meta-analysis, therefore we could not perform sensitivity and subgroup analysis.

## **R E S U L T S**

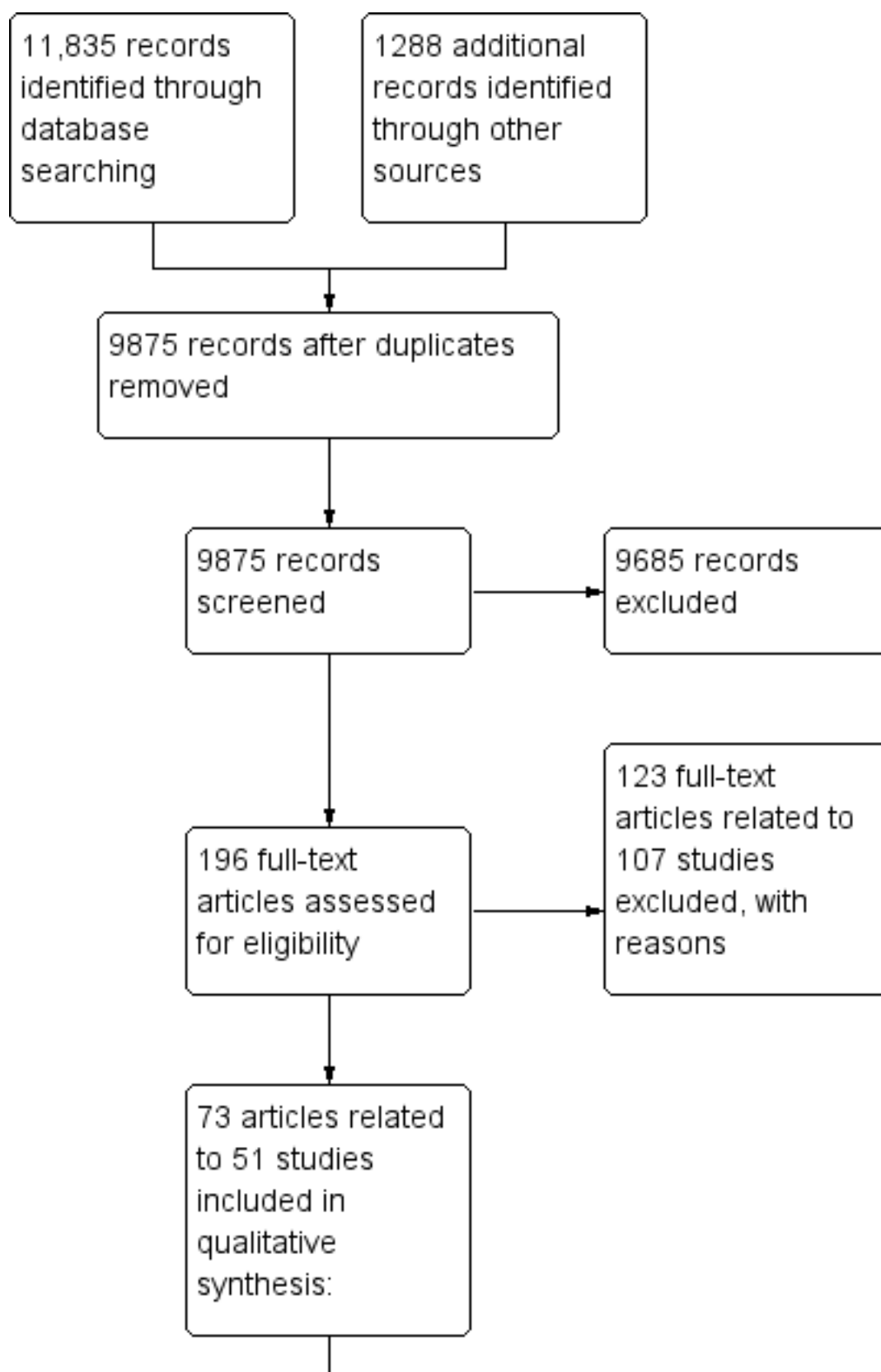
### **Description of studies**

#### **Results of the search**

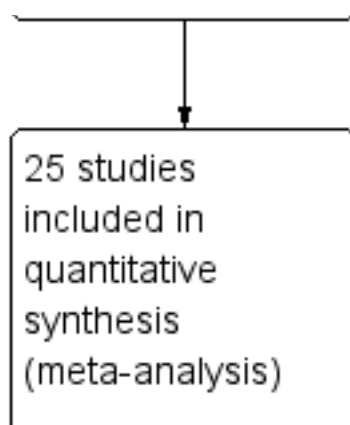
After removing duplicates the literature search identified 9875 records. We excluded 9685 on the basis of title and abstract. We retrieved 196 articles in full text for more detailed evaluation. We excluded 123 articles related to 107 studies. Seventy-three articles related to 51 studies satisfied all the criteria to be included in the review. See [Figure 1](#).



**Figure 1. Study flow diagram.**



**Figure 1. (Continued)**



### Included studies

We included a total of 51 studies (73 reports) with 127,146 participants involved.

### Types of interventions and comparisons

- Twenty-seven studies comparing 28 programmes adopted a social competence approach versus no intervention or usual curriculum (see [Table 7](#)).
- Eight studies compared a social influence approach versus no intervention or usual curricula (see [Table 8](#)).
- Seven studies compared a combined approach versus no intervention or usual curricula (see [Table 9](#)).
- Two studies compared a programme based on knowledge only versus no intervention or usual curricula (see [Table 10](#)).
- Four studies compared other approaches versus no intervention or usual curricula (see [Table 11](#)).
- Seven studies assessed 11 different comparisons (see [Table 12](#)).

### Duration and intensity of the intervention

Five interventions lasted one school year, 18 more than one school year and 29 less than one school year, varying from one hour ( $n = 1$ ) to one day ( $n = 3$ ), one month or less ( $n = 8$ ), three months ( $n = 4$ ), four months ( $n = 4$ ), six months ( $n = 7$ ) and seven months ( $n = 1$ ). In all other cases the duration was not clearly specified. Fifteen programmes provided a booster session and the number of session ranged from three to 15.

### Deliverers and educational techniques

All but four interventions used an interactive modality, but in 18 studies the modality was not reported. Twenty-six programmes were conducted by classroom teacher, 32 by external educator only and 10 by teachers and project staff together; eight used also the aid of a peer leader. In some cases the deliverer of the intervention was not clearly specified.

### Student grades at the time of intervention

Two interventions were delivered to first graders (six years), three to third graders (nine years), one to fifth graders (11 years), seven to sixth graders (12 years), one to fourth to sixth graders together (10 and 12 years), 10 to seventh graders (13 years), two to seventh and eighth graders together (13 and 14 years), one to seventh to ninth graders (13 to 15 years), seven to 12th graders (18 years), one to ninth graders (15 years), one to 10th and 11th graders together (16 to 17 years) and one to 11th graders (17 years). Five interventions were delivered at elementary school, five at middle school, seven at high school and one at college. In the remaining cases the grades were not specified.

### Country

Forty-one studies were conducted in the USA, two in Australia and the UK and one in China, South Africa, Hong Kong, Hawaii and the Czech Republic, respectively. One was a European multicentre study.

### Length of follow-up

Follow-up ranged from immediately after the end of the intervention to 10 years (see [Table 9](#)). For the analysis, we grouped studies into those with less than one year of follow-up and those with follow-up of equal to or greater than one year.

### Excluded studies

We excluded 107 studies (123 reports). The grounds for exclusion were: study design did not meet the inclusion criteria ( $n = 55$ ); type of participants did not meet the inclusion criteria ( $n = 14$ ); type of intervention did not meet the inclusion criteria ( $n = 19$ ); type of outcomes did not meet the inclusion criteria ( $n = 16$ ); and type of comparison did not meet the inclusion criteria ( $n = 3$ ).

### Risk of bias in included studies

See [Figure 2](#) and [Figure 3](#) for the assessment of the risk of bias in the included studies.

**Figure 2. 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.**

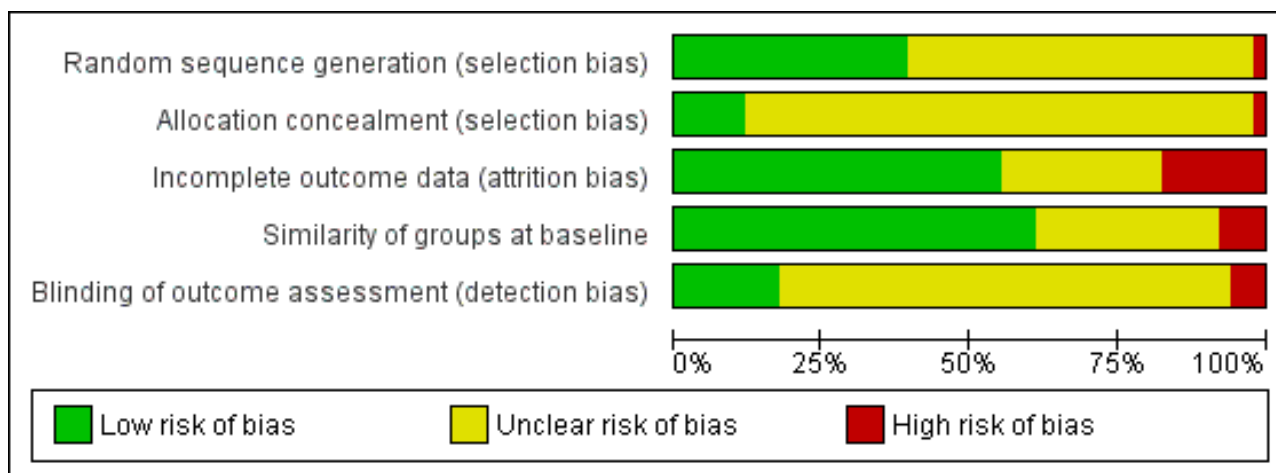


Figure 3. 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Incomplete outcome data (attrition bias)	Similarity of groups at baseline	Blinding of outcome assessment (detection bias)
ADM 1992	?	?	+	?	+
ALERT 1990	+	?	+	+	?
ALERT 2003	+	?	+	+	?
ALERT 2005	?	?	+	+	+
ALERT 2009	+	-	+	-	?
ASAP 1987	?	?	?	?	?
ATD 2010	?	+	?	-	-
CLIMATE 2009	+	?	+	?	?
CMER 2010	?	?	+	+	?
CROSS AGE TUT 1985	?	?	+	?	?
DARE 1991	?	?	+	+	?

Figure 3. (Continued)

DARE 1991	?	?	+	+	?
DARE 1991 B	?	?	+	+	+
DARE 2003	?	?	?	+	?
DRS 1993	?	?	?	?	?
GATEHOUSE 2004	?	?	+	+	?
GOOD BEHAVIOR GAME 2004	?	?	+	+	+
GOOD BEHAVIOR GAME 2012	?	?	-	+	+
KACM 1991	?	?	+	+	?
KEEPIN' IT REAL 2003	+	?	?	+	?
KEEPIN' IT REAL 2008	?	?	-	+	?
KEEPIN' IT REAL 2010	+	?	-	?	?
LST 1984	?	?	+	?	?
LST 1990	+	?	+	+	-
LST 1994	?	?	+	-	?
LST 2001	+	?	+	+	?
LST 2006	?	?	?	+	?
LST and KEPT LEFT 2008	+	?	-	+	?
MOTIVATIONAL INTERV 2011	+	+	+	+	?
NAPA 1984	?	?	?	?	?
PATHS 2012	?	?	-	?	?
PAY 1984	?	?	?	?	+

Figure 3. (Continued)

FAT 1984	?	?	?	?	+
POSITIVE ACTION 2009	+	?	-	+	?
PROJECT ACTIVE 2011	+	+	+	+	?
PROJECT CHARLIE 1997	?	?	?	+	+
PROJECT SPORT 2005	+	+	?	+	?
REHEARSAL PLUS 1990	?	?	+	?	?
REHEARSAL PLUS 1993	?	?	-	+	-
REHEARSAL PLUS 1995	?	?	+	?	?
Sexter 1984	-	?	?	?	?
Sigelman 2003	?	?	+	+	?
SKILLS FOR ADOL 2002	+	?	+	+	+
SMART 1988	?	?	+	-	?
SMART 1991	?	?	-	?	?
TCYL 2009	+	?	+	+	?
THINK SMART 2009	+	+	+	?	?
TND 1998	+	?	?	+	?
TND 2001	?	?	+	+	?
TND 2002	+	?	?	?	?
TND 2008	+	?	?	+	?
UNPLUGGED 2008	+	+	+	+	+
UNPLUGGED 2012	?	?	-	+	?

## Allocation

### Sequence generation

Sequence generation was adequate in 20 studies; it was unclear in 30 studies and inadequate in one study.

### Allocation concealment

We judged allocation concealment as adequate in six studies; it was unclear in 44 studies and inadequate in one study.

## Blinding

### Performance bias

Blinding of participants and providers was not possible for this type of intervention.

### Detection bias

We judged blinding of outcome assessment as adequate in nine trials for subjective outcomes; it was unclear in 39 studies and we judged it inadequate in three studies.

### Incomplete outcome data

Incomplete outcome data were correctly addressed in 28 studies; attrition bias was unclear in 14 studies and we judged it a high risk in nine studies.

### Other potential sources of bias

We judged the similarity of groups at baseline as having low risk of bias in 32 studies; it was unclear in 15 studies and we judged it a high risk of bias in four studies.

## Effects of interventions

See: [Summary of findings for the main comparison Social competence versus usual curricula for illicit drug use](#); [Summary of findings 2 Social influence versus usual curricula for illicit drug use](#); [Summary of findings 3 Combined programmes versus usual curricula for illicit drug use](#)

### 1. Social competence versus usual curricula or no intervention

See [Summary of findings for the main comparison](#).

#### Marijuana use

Fourteen studies assessed this outcome ([ADM 1992](#); [DRS 1993](#); [GATEHOUSE 2004](#); [KEEPIN' IT REAL 2003](#); [KEEPIN' IT REAL 2010](#); [LST 1984](#); [LST 1990](#); [LST 2001](#); [LST and KEPT LEFT 2008](#); [PAY 1984](#); [Sexter 1984](#); [SKILLS FOR ADOL 2002](#); [SMART 1988](#); [THINK SMART 2009](#)).

#### Short-term follow-up (< 12 months)

Four studies with 9456 participants reported dichotomous data (use in the past 30 days) ([ADM 1992](#); [GATEHOUSE 2004](#); [LST 1990](#); [LST and KEPT LEFT 2008](#)), which could be input in a meta-analysis. This showed results in favour of the social competence intervention (risk ratio (RR) 0.90; 95% confidence interval (CI) 0.81 to 1.01) ([Analysis 1.1](#)).

One study with 3417 participants provided continuous data for the frequency of marijuana use, with the period not specified ([LST 2001](#)). This showed an effect in favour of the social competence intervention (mean difference (MD) -0.10; 95% CI -0.20 to -0.00) ([Analysis 1.2](#)).

A total of eight studies assessed this outcome, but did not provide data for meta-analysis. Three of them found a positive effect of intervention, which was statistically significant in one case ([SKILLS FOR ADOL 2002](#)), and non-significant in two cases ([DRS 1993](#); [Sexter 1984](#)). Two studies found a significant effect in favour of the control group ([DARE 1991](#); [SMART 1988](#)). (See [Table 1](#)).

#### Long-term follow-up (12+ months)

One study with 2678 participants provided dichotomous data for use in the past 30 days ([GATEHOUSE 2004](#)). This showed results in favour of the social competence intervention (RR 0.86; 95% CI 0.74 to 1.00) ([Analysis 1.3](#)).

One study with 1075 participants provided continuous data for past year frequency of marijuana use ([ADM 1992](#)). This showed no differences between the social competence intervention and control (MD -0.02; 95% CI -0.10 to 0.06) ([Analysis 1.4](#)).

A total of seven studies assessed this outcome, but did not provide data for meta-analysis. Two showed a positive significant effect of intervention ([KEEPIN' IT REAL 2003](#); [LST 1984](#)), three showed a non-significant effect of the intervention ([PAY 1984](#); [SKILLS FOR ADOL 2002](#); [THINK SMART 2009](#)), one found a significant effect in favour of the control group ([SMART 1988](#)), and one found a trend in favour of the control group ([DARE 1991](#)). (See [Table 1](#)).

#### Hard drug use

Six studies assessed this outcome ([ADM 1992](#); [DRS 1993](#); [GOOD BEHAVIOR GAME 2004](#); [LST and KEPT LEFT 2008](#); [PAY 1984](#); [Sexter 1984](#)).

#### Short-term follow-up (< 12 months)

One study with 2090 participants provided dichotomous data for use in the past 30 days ([LST and KEPT LEFT 2008](#)). This showed no difference between the social competence intervention and controls (RR 0.69; 95% CI 0.40 to 1.18) ([Analysis 1.5](#)).

A total of two studies assessed this outcome without providing data for meta-analysis: one showed comparable results for the intervention and control group ([Sexter 1984](#)); one found a statistically non-significant trend in favour of intervention ([DRS 1993](#)). (See [Table 10](#)).

#### Long-term follow-up (12+ months)

One study with 1075 participants provided continuous data for past year frequency of use ([ADM 1992](#)). This showed no differences between intervention and controls (MD -0.01; 95% CI 0.06 to 0.04) ([Analysis 1.6](#)).

Only one study assessed this outcome, but did not provide data for meta-analysis. This showed comparable results for the intervention and control group ([PAY 1984](#)). (See [Table 10](#)).

#### Other drug use

Six studies assessed this outcome ([DARE 1991 B](#); [LST 2001](#); [Sexter 1984](#); [SKILLS FOR ADOL 2002](#); [THINK SMART 2009](#)).

#### Short-term follow-up (< 12 months)

One study with 1270 participants provided dichotomous data for use in the past 30 days ([DARE 1991 B](#)). This showed an effect in

favour of the social competence intervention (RR 0.72; 95% CI 0.53 to 0.98) ([Analysis 1.7](#)).

One study with 3434 participants provided continuous outcomes for frequency of use ([LST 2001](#)). This showed results that were nearly statistically significant in favour of the social competence intervention (MD -0.05; 95% CI -0.11 to 0.01) ([Analysis 1.8](#)).

Two studies assessed this outcome, but did not provide data for meta-analysis. One showed comparable results for the intervention and control group ([SKILLS FOR ADOL 2002](#)), and one showed a non-significant trend in favour of intervention ([Sexter 1984](#)). (See [Table 10](#)).

#### Long-term follow-up (12+ months)

Two studies assessed this outcome, but did not provide data for meta-analysis. One showed comparable results for the intervention and controls ([SKILLS FOR ADOL 2002](#)), and one found a significant effect of intervention ([THINK SMART 2009](#)).

#### Any drug use

Six studies assessed this outcome ([CMER 2010](#); [KEEPIN' IT REAL 2008](#); [KEEPIN' IT REAL 2010](#); [PATHS 2012](#); [PAY 1984](#); [POSITIVE ACTION 2009](#)).

#### Short-term follow-up (< 12 months)

Two studies with 2512 participants provided dichotomous data for use in the past 30 days ([CMER 2010](#); [POSITIVE ACTION 2009](#)). This showed results in favour of social competence interventions (RR 0.27; 95% CI 0.14 to 0.51) ([Analysis 1.9](#)).

One study with 1566 participants provided continuous data for frequency of use ([KEEPIN' IT REAL 2008](#)). This showed no difference between the social competence intervention and controls (MD 0.02; 95% CI -0.05 to 0.09) ([Analysis 1.10](#)).

One study assessed this outcome, but did not provide data for meta-analysis ([KEEPIN' IT REAL 2010](#)). This showed a positive significant effect in favour of the control intervention group. (See [Table 1](#)).

#### Long-term follow-up (12+ months)

Two studies assessed this outcome, but did not provide data for meta-analysis. One showed non-significant differences between the intervention and control groups ([PAY 1984](#)), and the other showed results in favour of the social competence approach ([PATHS 2012](#)). (See [Table 1](#)).

#### Drug knowledge

Eight studies assessed this outcome ([LST 1984](#); [LST 2001](#); [LST 2006](#); [KACM 1991](#); [NAPA 1984](#); [PROJECT CHARLIE 1997](#); [REHEARSAL PLUS 1993](#); [REHEARSAL PLUS 1995](#)).

#### Short-term follow-up (< 12 months)

Four studies with 3593 participants reported data for meta-analysis ([LST 2001](#); [PROJECT CHARLIE 1997](#); [REHEARSAL PLUS 1993](#); [REHEARSAL PLUS 1995](#)). This showed no differences between the social competence intervention and controls (MD 1.02; 95% CI 0.11 to 1.93), but we observed a very high level of heterogeneity ( $I^2 = 94\%$ ) ([Analysis 1.11](#)).

One study assessed this outcome as a continuous variable, finding comparable results for the intervention and control groups ([NAPA 1984](#)). Another study found results in favour of the social competence approach ([LST 2006](#)). (See [Table 1](#)).

#### Long-term follow-up (12+ months)

Three studies assessed this outcome, but did not provide data for meta-analysis. Two showed a significant effect of intervention ([LST 1984](#); [NAPA 1984](#)), and one showed comparable results for the intervention and control groups ([KACM 1991](#)). (See [Table 1](#)).

#### Intention to use marijuana

Three studies assessed this outcome ([DARE 2003](#); [LST 2001](#); [SKILLS FOR ADOL 2002](#)).

#### Short-term follow-up (< 12 months)

One study with 3417 participants provided continuous data ([LST 2001](#)). This showed results in favour of the social competence intervention (MD -0.12; 95% CI -0.19 to -0.05) ([Analysis 1.12](#)).

One study, which did not provide data for meta-analysis, showed a trend in favour of treatment, but this was not statistically significant ([DARE 2003](#)). (See [Table 10](#)).

#### Long-term follow-up (12+ months)

In one study there was a trend in favour of intervention, but it was not statistically significant ([DARE 2003](#)); in another it was in favour of control, but was not statistically significant ([SKILLS FOR ADOL 2002](#)). (See [Table 10](#)).

#### Intention to use hard drugs

Two studies assessed this outcome ([LST 2001](#); [SKILLS FOR ADOL 2002](#)).

#### Short-term follow-up (< 12 months)

One study with 3417 participants provided continuous data ([LST 2001](#)). This showed no differences between the social competence intervention and controls (MD -0.01; 95% CI -0.04 to 0.02) ([Analysis 1.13](#)).

#### Long-term follow-up (12+ months)

One study assessed this outcome, but did not provide data for meta-analysis ([SKILLS FOR ADOL 2002](#)). This showed a significant positive effect of intervention. (See [Table 10](#)).

#### Intention to use other drugs

Two studies assessed this outcome ([DARE 2003](#); [LST 2001](#)).

#### Short-term follow-up (< 12 months)

One study with 3417 participants provided continuous data ([LST 2001](#)). This showed results in favour of the social competence intervention (MD -0.04; 95% CI -0.07 to -0.01) ([Analysis 1.14](#)).

One study, which did not provide data for meta-analysis ([DARE 2003](#)), found a significant protective effect only for males and only for the programme DARE Plus. (See [Table 10](#)).



### Long-term follow-up (12+ months)

One study, which did not provide data for meta-analysis, found a protective effect, but this was not significant, either in respect of gender or in respect of the programme ([DARE 2003](#)). (See [Table 10](#)).

### Intention to use any drugs

Four studies assessed this outcome ([KEEPIN' IT REAL 2008](#); [KEEPIN' IT REAL 2010](#); [PATHS 2012](#); [PROJECT CHARLIE 1997](#)).

### Short-term follow-up (< 12 months)

One study with 120 participants provided dichotomous data ([PROJECT CHARLIE 1997](#)). This showed no difference between the social competence and control intervention (RR 0.21; 95% CI 0.02 to 1.8) ([Analysis 1.15](#)).

One study with 1566 participants provided continuous data ([KEEPIN' IT REAL 2008](#)). This showed no differences between the social competence intervention and controls (MD 0.04; 95% CI -0.07 to 0.15) ([Analysis 1.16](#)).

Two studies did not provide data for meta-analysis ([KEEPIN' IT REAL 2003](#); [KEEPIN' IT REAL 2010](#)). One found a significant protective effect of intervention while the other favoured the control group. (See [Table 1](#)).

## 2. Social influence versus usual curricula or no intervention

See [Summary of findings 2](#)

### Marijuana use

Eight studies assessed this outcome ([ALERT 1990](#); [ALERT 2003](#); [ALERT 2005](#); [ALERT 2009](#); [ATD 2010](#); [CLIMATE 2009](#); [SMART 1988](#); [TND 2008](#)).

### Short-term follow-up (< 12 months)

Three studies with 10,716 participants provided dichotomous data for meta-analysis ([ALERT 2003](#); [ALERT 2009](#); [ATD 2010](#)). This found a nearly statistically significant effect in favour of the social influence approach (RR 0.88; 95% CI 0.72 to 1.07) ([Analysis 2.1](#)).

One study with 764 participants provided continuous data ([CLIMATE 2009](#)). This showed results in favour of the social influence intervention (MD -0.26; 95% CI -0.48 to -0.04) ([Analysis 2.2](#)).

### Long-term follow-up (12+ months)

One study with 5862 participants provided dichotomous data ([ALERT 2009](#)). This found no differences between the social influence and control intervention (RR 0.95; 95% CI 0.81 to 1.13) ([Analysis 2.3](#)).

One study with 764 participants provided continuous data ([CLIMATE 2009](#)). This showed results that were nearly statistically significant in favour of the social influence intervention (MD -0.22; 95% CI -0.46 to 0.02) ([Analysis 2.4](#)).

Of the four studies that did not provide data for meta-analysis ([ALERT 1990](#); [ALERT 2005](#); [SMART 1988](#); [TND 2008](#)), a statistically significant level of protective effect on marijuana use was reached only by one study ([ALERT 1990](#)), and only for the subgroup of health educator-led intervention among cigarette and marijuana baseline non-users. (See [Table 2](#)).

### Hard drug use

One study assessed this outcome ([TND 2008](#)).

### Long-term follow-up (12+ months)

This study, which did not provide data for meta-analysis, found a significant protective effect of intervention. (See [Table 2](#)).

### Other drug use

One study assessed this outcome ([ALERT 2009](#)).

### Short-term follow-up (< 12 months)

One study with 5862 participants provided dichotomous data ([ALERT 2009](#)). This found no difference between the social influence and control intervention (RR 1.08; 95% CI 0.93 to 1.27) ([Analysis 2.5](#)).

### Long-term follow-up (12+ months)

One study with 5862 participants provided dichotomous data ([ALERT 2009](#)). This showed results in favour of the social influence intervention (RR 1.33; 95% CI 1.13 to 1.57) ([Analysis 2.6](#)).

### Any drug use

No studies assessed this outcome.

### Drug knowledge

One study assessed this outcome ([CLIMATE 2009](#)).

### Short-term follow-up (< 12 months)

One study enrolled 764 participants and provided continuous data ([CLIMATE 2009](#)). This showed no differences between the social influence intervention (MD 1.50; 95% CI 0.58 to 2.42) ([Analysis 2.7](#)).

### Long-term follow-up (12+ months)

One study with 764 participants provided continuous data ([CLIMATE 2009](#)). This showed no difference between the social influence intervention and control (MD 1.65; 95% CI 0.69 to 2.61) ([Analysis 2.8](#)).

### Intention to use marijuana

One study assessed this outcome, but did not provide data for meta-analysis ([ALERT 2005](#)).

### Long-term follow-up (12+ months)

This study favoured the control group versus teen-led intervention, with a statistically significant result (P value < 0.05). (See [Table 2](#)).

### Intention to use hard drugs, other drugs and any drugs

No studies assessed these outcomes.

## 3. Combined programmes versus usual curricula or no intervention

See [Summary of findings 3](#).

### Marijuana use

Seven studies assessed this outcome ([TCYL 2009](#); [TND 1998](#); [TND 2001](#); [TND 2002](#); [TND 2008](#); [UNPLUGGED 2008](#); [UNPLUGGED 2012](#)).

### Short-term follow-up (< 12 months)

Three studies with 8701 participants provided dichotomous data for meta-analysis (TND 1998; UNPLUGGED 2008; UNPLUGGED 2012). This showed a nearly statistically significant effect in favour of intervention (RR 0.79; 95% CI 0.59 to 1.05) (Analysis 3.1).

One study with 693 participants also provided continuous data (TND 1998). This showed no difference between combined intervention and control group (MD -1.90; 95% CI -5.83 to 2.03) (Analysis 3.2).

### Long-term follow-up (12+ months)

Six studies with 26,850 participants provided dichotomous data for meta-analysis (TCYL 2009; TND 2001; TND 2002; TND 1998; UNPLUGGED 2008; UNPLUGGED 2012). This showed statistically significant results in favour of the combined intervention (RR 0.83; 95% CI 0.69 to 0.99) (Analysis 3.3).

One study with 690 participants provided continuous data (TND 1998). This showed no difference between the combined intervention and control group (MD -0.80; 95% CI -4.39 to 2.79) (Analysis 3.4).

Two studies, which did not provide data for meta-analysis, did not find a significant effect of treatment (TND 2001; TND 2008). (See Table 3).

### Hard drug use

#### Short-term follow-up (< 12 months)

One study with 693 participants provided both dichotomous and continuous data (TND 1998). This showed conflicting results: there were no differences between combined intervention and controls for dichotomous outcomes (RR 0.85; 95% CI 0.63 to 1.14), but the results were in favour of the combined intervention for continuous outcome (MD -3.10; 95% CI -5.90 to -0.30) (Analysis 3.5; Analysis 3.6).

#### Long-term follow-up (12+ months)

Two studies with 1066 participants provided dichotomous data for meta-analysis (TND 1998; TND 2002). This showed no difference between the combined intervention and control (RR 0.86; 95% CI 0.39 to 1.90) (Analysis 3.7).

One study with 690 participants also provided continuous data (TND 1998). This showed no differences between the combined intervention and control group (MD 0.30; 95% CI -1.36 to 1.96) (Analysis 3.8).

Two studies, which did not provide data for meta-analysis, showed a significant effect of treatment (TND 2001; TND 2008). (See Table 3).

### Any drug use

One study assessed this outcome (UNPLUGGED 2008).

#### Short-term follow-up (< 12 months)

One study with 6362 participants provided dichotomous data (UNPLUGGED 2008). This showed results in favour of the combined intervention (RR 0.76; 95% CI 0.64 to 0.89) (Analysis 3.9).

### Other drugs use, drug knowledge, intention to use marijuana, hard drugs, other drugs, any drug

No studies assessed these outcomes.

## 4. Knowledge versus usual curricula or no intervention

### Marijuana use

One study, which did not provide data for meta-analysis, assessed this outcome (Sexter 1984).

#### Short-term follow-up (< 12 months)

The data showed a trend in favour of the control group, which was not statistically significant. (See Table 4).

### Hard drug use

One study, which did not provide data for meta-analysis, assessed this outcome (Sexter 1984).

#### Short-term follow-up (< 12 months)

The data showed a trend in favour of the intervention group, which was not statistically significant. (See Table 4).

### Other drug use

One study, which did not provide data for meta-analysis, assessed this outcome (Sexter 1984).

#### Short-term follow-up (< 12 months)

The data showed a trend in favour of the control group, which was not statistically significant. (See Table 4).

### Drug knowledge

One study assessed this outcome (Sigelman 2003).

#### Short-term follow-up (< 12 months)

One study with 165 participants provided continuous data (Sigelman 2003). This showed results in favour of a knowledge-focused intervention (MD 0.10; 95% CI 0.05 to 0.15) (Analysis 4.1).

### Intention to use hard drugs

One study assessed this outcome (Sigelman 2003).

#### Short-term follow-up (< 12 months)

One study with 165 participants provided continuous data (Sigelman 2003). This showed no difference between a knowledge-focused intervention and controls (MD -0.05; 95% CI -0.24 to 0.14) (Analysis 4.2).

### Any drug use, intention to use marijuana, other drugs, any drugs

No studies assessed these outcomes.

## 5. Other programmes versus usual curricula or no intervention

Four studies were included in this comparison (ASAP 1987; GOOD BEHAVIOR GAME 2004; GOOD BEHAVIOR GAME 2012; Sexter 1984).

Two of them assessed marijuana and hard drug use (GOOD BEHAVIOR GAME 2004; Sexter 1984). One assessed any drug use (GOOD BEHAVIOR GAME 2012), and the last assessed knowledge (Sexter 1984).

The types of comparisons and the programmes assessed were very heterogeneous and difficult to synthesise. Detailed descriptions of comparisons and results are reported in [Table 11](#) and [Table 5](#), respectively. We provide description of the two Good Behaviour Game (GBG) studies ([GOOD BEHAVIOR GAME 2004](#); [GOOD BEHAVIOR GAME 2012](#)), because they represent an original intervention based on a more 'developmental inspired' theoretical approach compared to that used for the programme classification in this review.

One study with 370 participants provided dichotomous data for use in the past 30 days ([GOOD BEHAVIOR GAME 2004](#)). This showed an effect in favour of the intervention (RR 0.36; 95% CI 0.13 to 0.98). The second study used as an outcome the lifetime occurrence of drug abuse and dependence disorders at age 19 to 21 (15 years after the intervention) as diagnosed by health services. In this study the results are significantly in favour of GBG compared with no intervention (ARR = 19%; P value = 0.01).

## 6. Other comparisons

Seven studies with 11 comparison were included in this group ([CROSS AGE TUT 1985](#); [LST 1994](#); [MOTIVATIONAL INTERV 2011](#); [PROJECT ACTIVE 2011](#); [PROJECT SPORT 2005](#); [REHEARSAL PLUS 1990](#); [SMART 1991](#)).

Four studies assessed marijuana use ([MOTIVATIONAL INTERV 2011](#); [PROJECT ACTIVE 2011](#); [PROJECT SPORT 2005](#); [SMART 1991](#)); one assessed intention to use marijuana and other drugs ([LST 1994](#)); and three studies assessed knowledge ([CROSS AGE TUT 1985](#); [LST 1994](#); [REHEARSAL PLUS 1995](#)).

The types of comparisons and the programmes assessed were very heterogeneous and difficult to synthesise. Detailed descriptions of comparisons and results are reported in [Table 12](#) and [Table 6](#), respectively.

## DISCUSSION

### Summary of main results

The first version of this systematic review, New Reference, included 29 randomised trials that evaluated the effects of school-based interventions for the prevention of drug use, all of which were conducted in the USA, with the exception of one. This new release of the review includes 51 studies, of which 41 were conducted in the USA. In the past nine years, 22 new includable studies have been published, with a much more equitable distribution of countries of origin (nine out of 22 were non-US studies).

In this new version of the review, there are two main changes: firstly, we have excluded observational studies, because they did not contribute anything to the evidence (New Reference), and secondly, we have slightly changed the classification of programmes. This was in order to better reflect the improvements in the conceptualisation of prevention programmes in recent years, and to follow the positive experience of the corresponding Cochrane review on school-based prevention of tobacco use ([Thomas 2013](#)). Following this classification, the main results of this review are as follows.

- Programmes based on social competence, which aim to improve personal and interpersonal skills, are in the large majority (28 out of 51 studies). They showed a similar tendency to reduce

the use of substances and the intention to use, and to improve knowledge about drugs, compared to usual curricula, but the effects were seldom statistically significant.

- Programmes based on social influence, which are focused on reducing the influence of society in general on the onset of use of substances, by normative education, for example, were assessed in eight studies. In general, the results appeared weak and were rarely significant.
- Programmes based on a combination of social competence and social influence approaches were assessed in seven out of 51 studies. They seemed to show, for some outcomes, better results than the other categories, with effective results in preventing marijuana use at longer-term follow-up, and in preventing any drug use.
- Only two studies assessed knowledge focused interventions and they showed no differences in outcomes among intervention and controls, apart from knowledge, which appeared to be improved among participants involved in the programme.
- The other programme category is the combination of different programmes and approaches, however the differences were so great that it was not possible to consider them as an homogeneous class.

Another important observation is that some programmes showed adverse effects, for example a significant increase in the use of marijuana in the affective strategy of Smart Program ([SMART 1988](#)), or in the use of other drugs ([ALERT 2009](#)); this has also happened for more recent programmes, although only for tobacco use and binge drinking ([TCYL 2009](#)). Although a chance effect could be a possible explanation, given the high number of comparisons included in the review, this cannot prevent the reinforcement of our suspicion that the evolution of the design of interventions has in the past been very slow, as it has not prevented the development of harmful programmes.

Some programmes did not show an expected consistency between their effects on marijuana use and their effects on hard drug use, but this appears to be a chance effect, given the low numbers in the analysis for hard drug use.

Several other issues deserve deeper discussion:

### Programme classification and programme theory base

We adopted the classification already used in another Cochrane review ([Thomas 2013](#)), in fact a variation of that also used in the first version of this review. However, once two review authors had independently classified the programmes, we realised that this was extremely complex and quite arbitrary: the description of the theory base for the programmes is often approximate and sometimes misleading, the programme structures sometimes do not adhere to theoretical principles and, especially, the theories cited are often bizarre and personal elaborations, or do not even have the rank of theories, but rather are operational approaches. In reality, most programmes seem to be based on a limited number of two root theories, for example the 'theory of planned behaviour' ([Ajzen 1985](#)), and social cognitive/social learning theory ([Bandura 1977](#)). Every programme seems to be a variable composition of these theories, however it is probably impossible to quantify accurately the contribution of each one.

## Programme composition and the role of single components

Programmes do not only differ on the basis of theories, but also in the structure of components. Programmes are a variable mix of components, without any standardisation: their composition ranges from one unit to 700 (140 per year over five years!). Evaluation studies commonly assess the overall effectiveness of interventions and they lack any ability to study how they work. What the components responsible for effectiveness are and how they singly or in combination exert their effect on outcomes remains unclear. This is a great limitation that compromises progressive learning.

However, the evidence produced by this large set of studies, involving 127,146 participants, does not seem to be any stronger than that produced in the first version of this review, at least considering school-based interventions in general.

Some more interesting issues come from the analysis of the results by programme approach, despite the limits of the classification discussed above. Programmes based on the social competence approach, largely coinciding with the skills-based programmes in the previous version of this review, appeared to have positive effects, especially in combination with the social influence approach. However, this cannot be used to infer that all programmes adopting this approach are actually effective, since we observed large variability in the results within the same approach, but it is a general suggestion. What really matters is probably the programme itself: there are some programmes that show a consistent pattern of positive results that can be recognised as effective, for example LST and 'Unplugged'. To confirm the weakness of the current theoretical classification, another programme showing a consistent pattern of positive results is Good Behaviour Game (GBG), a programme that cannot be classified with the current theories. This should hopefully favour the development of innovative programmes based on a similar theoretical approach.

By focusing on a programme, rather than on a theoretical approach, we have carried out a meta-analysis with programmes as subcategories. This analysis can reduce the heterogeneity produced by the diversity of programmes in the same category. This analysis was possible only for a few programmes and for a few outcomes, given the large variability of indicators used by the studies.

It must be stressed that the vast amount of research undertaken, especially since 1980, has not generated the expected amount of evidence on the effectiveness of primary prevention. We selected 158 trials, but only a fraction of their data could be used for our review. We excluded many trials because their quality was insufficient and we only included 51. However, the wide differences in the indicators, scales and scores employed to evaluate effectiveness made it difficult to summarise the evidence: the maximum number of randomised controlled trials (RCTs) in a single meta-analysis was only seven, and even data from multiple evaluations of successful programmes like LST could not be pooled because of the large variability in outcomes and scales across studies.

## Overall completeness and applicability of evidence

This review is based on an extensive search for studies, including some grey literature and doctoral thesis databases. We cannot

exclude the possibility of having missed some studies, but we are quite confident that we have achieved substantial completeness of data collection.

The programmes assessed cover the most relevant school-based prevention typologies, ranging from those based on knowledge to those based on more comprehensive approaches, but most studies compared a single programme to a usual curriculum. This lack of comparative evaluation is a weakness in this field of prevention that needs to be dealt with by large studies comparing one programme to another.

Finally, there is the issue of generalisability. In comparison with the previous version of this review, the current set of included studies are less USA-centred, with 10 out of 51 included studies coming from outside the USA. A nation's social context and drug policies can have a significant influence on the effectiveness of programmes and generalisation of programmes may raise concern. The transfer of effective programmes to substantially different contexts may require adaptation and re-evaluation.

## Quality of the evidence

The overall quality of the studies included is not really satisfactory:

- Only one RCT satisfied all five quality criteria used in the review and most studies satisfied fewer than three out of five quality criteria. In most cases this is due to a lack of information, rather than an actual problem, but nevertheless it is an indicator of lack of quality.
- The great variability in the outcomes adopted by the studies prevented the possibility of pooling more than seven studies in a meta-analysis. What is particularly surprising is that this variability also affected different evaluations of the same programme! For example, we included six different studies evaluating the programme Life Skills Training Program (LST), but we could not identify similar outcomes across the studies to allow us to build a meta-analysis with more than one LST study.
- Most of the comparisons were versus controls or no intervention and there was a lack of comparative effectiveness assessment, especially among more relevant interventions.
- Many RCTs did not present effect measures but only statistical indicators (e.g. *f*, *P* value) or other heterogeneous effect measures, so it was impossible to combine them in a meta-analysis.
- Control for heterogeneity was not satisfactory. Some sources of heterogeneity were controlled for by the design of this review (outcomes, methods of intervention, design and quality of the study), but many other sources of 'clinical' heterogeneity (e.g. grade of the target classes, intensity of the intervention, duration of follow-up) could not be taken into account. There are not enough trials in the strata of each eligible variable to permit meta-regression (Sterne 2001). Under these conditions, we adopted random-effects models for all analyses.

See [Summary of findings for the main comparison](#); [Summary of findings 2](#); [Summary of findings 3](#).

## Potential biases in the review process

Most school-based interventions are clustered, because the intervention is delivered at the level of the school. However, only recent trials took into account the cluster structure of the



observation, carrying out appropriate cluster-randomised trials. In order to allow inclusion in meta-analysis, in this review we used crude data for all trials. This did not change the effect size, but affected precision, because multilevel analysis estimates corrected confidence intervals to be more conservative. We estimate that the effect is not large, considering that we adopted a random-effects model for all meta-analyses, which is a conservative model.

Another limit of this review is the lack of stratification for several essential variables, which act as moderator; for example, the target age group or gender. However, this was not possible, given the low number of studies that allowed for it.

### Agreements and disagreements with other studies or reviews

The pattern of our results is consistent with those published by Tobler (Tobler 2000), to whom credit is due for having developed and conducted the first systematic review on the effectiveness of primary drug prevention and for having kept it up to date for so many years (Tobler 1986; Tobler 1997). She and her colleagues were almost alone for many years in providing a quantitative summary of effectiveness, in which consideration was given to the quality of the methodological design, and some basic covariates such as the type of programme, interactivity etc. Many other reviews have been published since then. Some are systematic reviews, but they do not provide meta-analytic results (Hansen 1992; Skara 2003). Others give summary results but not from studies with high methodological quality (Bangert-Drowns 1988). Others focus on specific programmes (e.g. Ennett 1994), or a single component, such as peer involvement (Mellanby 2000).

Other reviews have focused on components that increase programme effectiveness and have discussed the role of the timing of interventions, booster sessions, content and delivery (McBride 2003), or have proposed graduated recommendations for effective programmes (Cuijpers 2002a).

More recently, some reviews have found consistent results. Midford 2010 concluded that there is a range of evidence based school-based prevention approaches, all based on the social influence model. Porath-Waller 2010 found that programmes incorporating elements of several prevention models were significantly more effective than those based on only a social influence model. Moreover, the author found a role of duration ( $\geq 15$  sessions), the type of deliverer (an external deliverer appears to be better than a teacher) and in the targeted age, with programmes targeting high school students appearing to be more effective than those aimed at middle school students. This is very useful for practice but cannot be addressed in a systematic review because the number of studies contributing to the comparisons is too limited.

The results of our work appear to be consistent with the Cochrane reviews of school-based smoking prevention (Thomas 2013), and alcohol prevention among young people (Foxcroft 2011), with which our review shares the identification of the more effective programmes. Two conclusions can be drawn from this consistency: first, it is an indirect confirmation of the theory that unifies the pathways of risk and risk factors for alcohol, tobacco and drugs among the young; second, it favours the delivery of a single school-level intervention to prevent the initial use of all harmful substances.

## AUTHORS' CONCLUSIONS

### Implications for practice

School-based programmes based on a combination of social competence and social influence approaches show, on average, small but consistent protective effects in preventing drug use, although some outcomes did not show statistical significance. Some programmes based on the social competence approach alone also show protective effects for some outcomes.

However, the approach is not the only determinant of effectiveness and some programmes inspired by a combined social competence-social influence approach did not show positive effects. The adoption of programmes showing positive effects can be recommended for practice in this field, such as, for example, life skills training and 'Unplugged'. Good Behaviour Game (GBG), although based on a different theoretical approach, also showed positive effects and can be recommended for adoption.

Since the effects of school-based programmes are small, a recommended option is to include them in more comprehensive strategies for drug prevention in order to achieve a population-level impact.

### Implications for research

Most research is focused on very similar programmes, based on a couple of theoretical approaches and shows small results. The number of programmes based on innovative approaches is small, but among them is one of the more effective programmes, GBG. The development and testing of programmes based on new approaches is recommended.

A sound theoretical approach is not enough to predict the results of an intervention and meta-analysis of programmes based on similar approaches sometimes has large limitations due to the clear diversity of programmes included. Meta-analysis of single programmes should be preferred in the future, provided that there are a sufficient number of studies.

School-based programmes are mostly composed of a number of components, for example the involvement of several units and sometimes parent components, boosters etc. The evaluation of these studies can only establish overall effectiveness and all detailed information about the effect on single components is lost. This prevents progressive learning about the mechanisms of effectiveness. Although mediator analysis only partially supports understanding of how programmes work, it is recommended for all evaluated programmes. However, new approaches for effectiveness analysis have to be proposed, which are able to disentangle the role of each component, in order for single effective components to be adopted in the development of new programmes.

There is still large heterogeneity in the indicators adopted by trialists and this often prevented us from including studies in meta-analysis. The use of more common outcome variables is still recommended.

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\* Indicates the major publication for the study

## CHARACTERISTICS OF STUDIES

### Characteristics of included studies [ordered by study ID]

#### ADM 1992

Methods	RCT Classrooms were grouped into homogeneous clusters based on socio-economic status and ethnicity, and then randomly divided into programme and control groups
Participants	1360 6th-grade students enrolled from 2 southern New England towns, USA. Academic years 1980 to 1981, 1981 to 1982
Interventions	<p><b>Experimental:</b> ADM (Adolescent Decision-Making) is a cognitive-behavioural skills intervention to familiarise students with the basic concepts of effective decision-making, to promote role flexibility, to increase students' abilities to recognise and manage peer pressure, and to enhance students' ability to turn to others for information and support when faced with decisions</p> <p>Social competence approach</p> <p>Deliverer: not reported</p> <p>n = 680</p> <p>Modality: not reported</p> <p>N of sessions: 12 sessions during 6th grade</p> <p>Booster: no</p> <p>Duration of the intervention: 3 months</p>

## ADM 1992 (Continued)

**Control:** type of intervention not reported, n = 680

Outcomes	Improvement of decision-making processes  Tobacco, alcohol, marijuana, hard drugs use
Notes	Outcome assessed at post-test (at the end of the intervention) and at 24 months (at 8th grade) after the end of the intervention.  Analysis sample at 24 months follow-up = 1075 (79% of the original sample), intervention group n = 545, control group n = 530  Attrition: 8.9% at post-test Attrition: 20.7% at 2-year follow-up: 19.6% for intervention and 21.8% for control group  Data suitable for inclusion in meta-analysis

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "at a first step in randomisation, schools were grouped into homogeneous clusters based on socioeconomic status and ethnic composition; classrooms were then randomly divided into Program and Control group"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were no significant differences in attrition rate between groups; logistic regression revealed an interaction for alcohol at baseline (control drop-outs were more likely to use alcohol at baseline than control 'stayers'); no interaction was found for tobacco, marijuana or hard drugs
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Questionnaires had code number but no name of the students. Trained raters scored coded questionnaires without knowledge of group assignment

## ALERT 1990

Methods	Cluster-RCT
Participants	6527 7th to 8th grade students enrolled from 30 junior high schools in California and Oregon (USA), 1984 to 1990 school years. 3912 students completed baseline survey
Interventions	<b>Experimental:</b> project ALERT, targeting alcohol, cigarettes and marijuana use, seeking to motivate the students to resist pro-drug influences and to give them the skills to do so  Social influence approach.  n = not reported (20 schools):  Group 1: adult health educator alone led n = not reported  Group 2: adult health educator led, teen assisted n = not reported  Deliverer:

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**ALERT 1990** (Continued)

Group 1 taught by an adult health educator alone  
Group 2 taught by the adult health educator assisted by teen leaders

Interactive modality

N of sessions: 8 lessons in 7th grade and 3 in the booster session the following year

Booster: yes

Duration of the intervention: overall over 2 school years, n of months not reported

**Control:** usual curricula, n: not reported

Outcomes	Use of alcohol, cigarettes and marijuana, measured by a questionnaire administered before and after delivery of 7th grade curriculum (baseline and 3 months later), before and after 8th grade booster lessons (12 and 15 months after baseline).  Beliefs about consequences of using substances, perceptions about use in peers, resistance self efficacy, expectations of use in next 6 months
Notes	Outcome assessed at post-test and at 3 months follow-up after the end of the intervention Attrition at post-test (3rd month): 18%  Analysis sample n = 3916, n intervention group not reported, n control group not reported  No data suitable for inclusion in meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "blocked randomisation by district, assignment restriction to a subset that produced little unbalance among experimental conditions in school test score, language spoken at home and drug use"; unit of randomisation: schools
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "we found no evidence that either attrition rates or which students were lost from the analysis varied across experimental conditions"
Similarity of groups at baseline	Low risk	Regression methods were used at the analysis stage to adjust for chance differences among the groups
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**ALERT 2003**

Methods	Cluster-RCT At the analysis stage, an adjustment for multiple baseline covariates was performed, including blocking covariates. Missing data for covariates were included using a Bayesian model. To account for possible intraschool correlation a generalised estimating equation and empirical sandwich standard errors were used
Participants	5412 7th grade students enrolled from 55 middle schools in South Dakota (USA), 1997 to 1999 school years

**ALERT 2003** (Continued)

4689 students completed baseline survey

Interventions	<p><b>Experimental:</b> project ALERT (revised), targeting alcohol, cigarettes and marijuana use, seeking to change student's beliefs about drug norms and consequences, and to help them to identify and resist pro-drug pressures</p> <p>Social influence approach</p> <p>n = 2810</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: 11 lessons in 7th grade and 3 in 8th grade</p> <p>Booster: no</p> <p>Duration of the intervention: 18 months</p> <p><b>Control group:</b> usual curricula n = 1879</p>
Outcomes	Use of marijuana, measured by a questionnaire administered before the delivery of 7th grade curriculum and after the administration of 8th grade lessons (approximately 18 months later). Drug use was assessed for lifetime use, past month and weekly use
Notes	<p>Outcome assessed: at post-test</p> <p>Attrition at post-test (18th month): 8.8%</p> <p>Analysis sample n = 4276; 2553 intervention group, 1723 control group</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Stratified randomisation by geographic area and community size and type (city, town and rural area). Within each strata blocked randomisation with blocks of 3 was used. Unit of allocation: school. A restricted assignment was used to reduce imbalance among groups using an index of school academic performance and socioeconomic status and the existence of a drug prevention programme in the district
Allocation concealment (selection bias)	Unclear risk	A restricted assignment was used to reduce imbalance among groups using an index of school academic performance and socioeconomic status and the existence of a drug prevention programme in the district
Incomplete outcome data (attrition bias) All outcomes	Low risk	Students who dropped out were more likely to be non-white, of lower socioeconomic class and to have tried alcohol, cigarettes and marijuana. However, the attrition rate and characteristic of students dropped out were similar across groups
Similarity of groups at baseline	Low risk	Students in the control group were less likely to be white and more likely to use marijuana. To reduce the effects of these differences there was adjustment for baseline covariates (use of drug, demographic characteristics, intentions and belief about drug use, perceived norms, pressure and social approval)
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## ALERT 2005

Methods	Cluster-RCT
Participants	1649 7th grade students from 8 Pennsylvania middle schools (USA)
Interventions	<p><b>Experimental:</b> project ALERT (revised), targeting alcohol, cigarettes and marijuana use, seeking to change student's beliefs about drug norms and consequences, and to help them to identify and resist pro-drug pressures</p> <p>Social influence approach</p> <p>Group 1: adult led, n = not reported</p> <p>Group 2: adult led, teen assisted, n = not reported</p> <p>Deliverer: project staff</p> <p>Interactive modality</p> <p>N of sessions: 11 lessons in 7th grade and 3 in 8th grade</p> <p>Booster: no</p> <p>Duration of the intervention: overall over 2 school years, n of months not reported</p> <p><b>Control group:</b> types of intervention: not reported, n: not reported</p>
Outcomes	Marijuana use (last month, last year, lifetime) on a 5-point scale
Notes	<p>Attrition (overall): 27.5%</p> <p>Outcome assessed at post-test and 12 months after the end of the intervention</p> <p>No data suitable for inclusion in meta-analysis</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "each of the eight schools randomly assigned two 7th grade classrooms to each of three conditions: adult led project ALERT, teen assisted Project ALERT, control"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "attrition was comparable across the three conditions"
Similarity of groups at baseline	Low risk	Quote: "no consistent pattern of differences emerged from the cohort, there was satisfactory evidence of equivalence among the treatment and control condition"
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Quote: "self report questionnaire was administered by school personnel to treatment and control classrooms"

## ALERT 2009

Methods	Cluster-RCT
Participants	5883 6th grade students from 34 schools in the USA 2004 to 2005 and 2005 to 2006 school years
Interventions	<p><b>Experimental:</b> ALERT programme. Manualised classroom-based substance use prevention curriculum which targets cigarette, alcohol, marijuana and inhalant use, motivates students not to use substances, provides skills to resist pressure from peers, supports attitudes and beliefs that mitigate substance use, addresses normative perceptions about peer use and acceptance</p> <p>Social influence approach</p> <p>N = 2817</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: 11 lessons in 6th grade and 3 in the booster session the following year</p> <p>Booster: yes</p> <p>Duration of the intervention: overall over 2 school years, n of months not reported</p> <p><b>Control:</b> usual curricula, n: 3045</p>
Outcomes	Marijuana use, inhalants use. Drug use was assessed for lifetime use; last 30 days
Notes	<p>Outcome assessed: at post-test and 1 year after the end of the intervention</p> <p>Attrition (overall): 21%</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "assignment was implemented through the use of computer generated random numbers"
Allocation concealment (selection bias)	High risk	Quote: "one of us randomly assigned schools to the experimental condition, blocked by school district. Assignments were made on a flow basis as soon as a district were paired and randomly assigned to a condition"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "differential attrition was not a problem because attrition was near 21% in both groups"
Similarity of groups at baseline	High risk	Schools in the control groups were more likely to offer prevention programmes not related to Project ALERT
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## ASAP 1987

Methods	RCT
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### Universal school-based prevention for illicit drug use (Review)



**ASAP 1987** (Continued)

Participants were randomly assigned to either the experimental or the control group

Participants	33 7th grade students from a mid-school in Albuquerque, New Mexico (USA). January 1985 to September 1985
Interventions	<p><b>Experimental:</b> ASAP (Alcohol and Substance Abuse Prevention Program) Participants received the standardised Berkeley Health Education Curriculum, and the ASAP programme, based on observation and interview of patients with alcohol and substance abuse problems. The ASAP programme was taught at the Emergency Department (ED) of the University. Medical students, ED staff and teacher supervised the visits. (n = 17)</p> <p>Knowledge-focused approach</p> <p><b>Control group:</b> Berkeley Health Education Curriculum: the curriculum presented short-term and long-term consequences of alcohol and drug abuse in a traditional work-book and didactic format, as well as role-play exercises, small group exercises and out of class assignments; discussing peer pressure and strategies to resist peer pressure. (n = 16)</p> <p>Knowledge-focused approach</p> <p>Deliverer: project staff</p> <p>Interactive modality</p> <p>N of sessions: not reported</p> <p>Booster: no</p> <p>Duration of the intervention: 6 months</p>
Outcomes	<p>Knowledge: consequences of use</p> <p>Drug use in the last 30 days</p>
Notes	<p>Outcome assessed at post-test and at 8 months follow-up after the end of the intervention</p> <p>No data suitable for inclusion in the meta-analysis</p> <p>Attrition: unclear</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "subjects were randomly assigned to either an experimental or control group"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Information not reported
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## ATD 2010

Methods	Cluster-RCT
Participants	1416 2nd to 6th grade students enrolled across 4 Catholic schools in Louisiana (USA): 670 participants initially recruited, 661 (333 boys; 328 girls) participated in baseline measurement, 7 students were absent, 1 student switched schools and 1 student withdrew. 348 assigned to ATD, 313 assigned to Healthy eating and exercise (HEE). 2 academic years (2003 to 2004)
Interventions	<p><b>Experimental:</b> ATD programme (Alcohol/Tobacco/Drug use/abuse), targeting alcohol, cigarettes and marijuana use</p> <p>Social influence approach</p> <p>n = 348</p> <p>Deliverer: teacher</p> <p>Modality not reported</p> <p>N of sessions: not reported</p> <p>Booster: no</p> <p>Duration of the intervention: overall over 2 school years, n of months = 18</p> <p><b>Control:</b> HEE programme; active control condition focused on obesity prevention (the Healthy Eating and Exercise), n: 313</p>
Outcomes	<p>Tobacco and alcohol expectancy</p> <p>Tobacco, alcohol and drug use</p>
Notes	<p>Outcome assessed at 6, 12 and 18 months after the initiation of the intervention</p> <p>Attrition not reported</p> <p>Analysis sample at 18-month assessment n = 578; 301 ATD group, 277 HEE group</p> <p>Data on substance expectancies for meta-analysis are partially reported in text and needed recalculation, while data on substance use are presented as beta and only in the footnotes of table 5; absolute numbers are reported</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported
Allocation concealment (selection bias)	Low risk	Quote: "The randomization was conducted by biostatisticians at Pennington Biomedical Research Center after the baseline data collection was completed. Therefore, treatment condition assignment was unknown to all parties prior to that point"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Seems to be a per protocol analysis
Similarity of groups at baseline	High risk	Statistically significant differences in:  % with family member(s) who smoke

## ATD 2010 (Continued)

		% with friend(s) who smoke % with cigarettes available from friends SCQ-C: negative consequences % tried alcohol % with family member(s) who drink AEQ-A: Global Positive Transformation AEQ-A: Cognitive & Motor Improvement AEQ-A: Deteriorates Cognition & Behavior AEQ-A: Tension Reduction % with friend(s) who use drugs
Blinding of outcome assessment (detection bias) subjective outcomes	High risk	Quote: "Participants and research team members interfacing with the schools could not remain blind to treatment condition assignment for obvious reasons"

## CLIMATE 2009

Methods	Cluster-RCT
Participants	764 students; mean age 13 years from 10 high school cross Sidney metropolitan area (Australia)
Interventions	<p><b>Experimental:</b> Climate Schools Alcohol and Cannabis course: each lesson included 15 to 20 minutes of Internet-based lesson completed individually where students followed a cartoon storyline of teenagers experiencing real-life situations and problems with alcohol and cannabis. The second part of each lesson was a predetermined activity delivered by the teacher to reinforce the information taught by the cartoon</p> <p>Social influence approach</p> <p>n = 397</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: 12</p> <p>Booster: no</p> <p>Duration of the intervention: 6 months</p> <p><b>Control group:</b> usual health classes: n = 367 participants</p>
Outcomes	<p>Cannabis knowledge questionnaire adapted from the Cannabis Quiz</p> <p>Cannabis use: assessed from a questionnaire in the 2007 National Drug Strategy Household Survey (NDSHS); assessed the frequency of use</p>
Notes	<p>Attrition (overall): 20%</p> <p>Outcome assessed at post-test, 6 and 12 months after the end of the intervention</p> <p>No data suitable for meta-analysis</p>
<b>Risk of bias</b>	
<b>Bias</b>	<b>Authors' judgement    Support for judgement</b>

## CLIMATE 2009 (Continued)

Random sequence generation (selection bias)	Low risk	Quote: "the 10 participating schools were assigned randomly using an online randomisation system (www.randomized.org) to either a control condition or the intervention condition"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	48% of the students completed the post-test survey in the experimental group and 69% in the control group. (3% completed the 18 months follow-up survey in the experimental group and 75% in the control group. There was no evidence of differential attrition
Similarity of groups at baseline	Unclear risk	The intervention group had higher alcohol and cannabis-related knowledge and higher alcohol consumption
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## CMER 2010

Methods	Cluster-RCT
Participants	798 students from 3 senior high schools in Wuhan, a city in central China, participated in the study at baseline; school years not reported
Interventions	<p><b>Experimental:</b> project CMER was designed to address the major cognitive, attitude, motivation and coping skills as the keys to prevent illicit drug use, such as general drug information, the negative impact of drug use, the relationship between the behaviour of drug use and AIDS, peer resistance skills, emotion adjusting skills</p> <p>Social competence approach</p> <p>n = 798</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: 6 lessons</p> <p>Booster: no</p> <p>Duration of the intervention: 3 months</p> <p><b>Control:</b> not reported</p>
Outcomes	<p>Attitude to drug use, knowledge of drugs, type of drug, social impact of drug use, drug use consequences for health Addiction, motivation to use drug, peer resistance skills</p> <p>Illegal substance use at least once, drug use in the previous 30 days, drug use more times</p>
Notes	<p>No attrition</p> <p>Outcome assessed at 3 months after the intervention</p> <p>Data are suitable for meta-analysis</p>

**CMER 2010** (Continued)

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not specified
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "A missing data analysis was performed to ensure completeness of the questionnaires. Incomplete cases were excluded and descriptive analyses were performed."
Similarity of groups at baseline	Low risk	Quote: "A series of t-tests examined whether the 2 groups differed in any of the variables, and the results showed that there were no significant differences (all $P > 0.05$ ) in any of the substance use variables except for the mean scores of drug use consequences to health. This indicated a high degree of comparability between groups prior to the intervention."
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**CROSS AGE TUT 1985**

Methods	RCT Students were matched on the basis of course selection, grade level, sex and grade point average for the prior semester, and randomly assigned to the groups
Participants	114 8th and 9th grade students volunteering for 2 service opportunity courses (Cross-Age-Tutoring and School Store). Initial sample included 58 students in Cross-Age-Tutoring and 56 students in School Store. Spring 1979 to Spring 1980. California, USA
Interventions	<b>Experimental</b> <ol style="list-style-type: none"> <li>1. Cross-Age-Tutoring: students were taught tutoring and communication skills and spent 4 days a week tutoring elementary students (<math>n = 29</math>)</li> <li>2. School Store: students were taught business and interpersonal skills and operated an on-campus store (<math>N = 28</math> experimental)</li> </ol> <p> Deliverer: project staff  Interactive modality  N of sessions: not reported  Booster: no  Duration of the intervention: 6 months </p> <b>Control:</b> no intervention ( $n = 29$ in Cross-Age study; $n = 28$ in School Store study)
Outcomes	Any drug current use, drug knowledge
Notes	Outcome assessed at post-test and at 1 year after the end of the intervention

## CROSS AGE TUT 1985 (Continued)

No data suitable for inclusion in the meta-analysis  
Attrition at the post-test: 20% to 25%  
Attrition at 1 year: 52% to 63%

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "voluntary students were randomly assigned to experimental or control condition"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition similar in all conditions
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## DARE 1991

Methods	Cluster-RCT 23 elementary schools were randomly assigned to receive the DARE curriculum; 8 schools were randomly selected as a comparison group
Participants	2071 6th grade students in the Lexington-Fayette County public schools, Kentucky (USA), 1987 to 1988 school year Follow-up evaluation each subsequent year until 10th grade, and again at 20 years of age
Interventions	<b>Experimental:</b> DARE programme. Cognitive, affective and social skills strategies, aimed to increase students' awareness of adverse consequences of drug use, build self esteem, improve decision-making and assertiveness in social settings (n = 1550) Social competence approach  Deliverer: police officers  Interactive modality  N of sessions: not reported in 6th grade  Booster: no  Duration of the intervention: 4 months  <b>Control group:</b> drug education lessons, which varied across schools (n = 521)
Outcomes	Frequency of past year use of marijuana.
Notes	Outcome assessed at post-test, 1, 2, 5 and 10 years after the end of the intervention  No data suitable for inclusion in the meta-analysis. Authors contacted without reply Attrition:

**DARE 1991** (Continued)

- 7% at post-test
- 18.4% at 7th grade
- 21.8% at 8th grade
- 35.0% at 9th grade
- 44.8% at 10th grade
- 51.6% at 19 to 20 years of age (analysis sample: n = 1002)

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Information not reported
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	22.1% for the experimental group and 20.7% for the control group at 2 years follow-up (8th grade)
Similarity of groups at baseline	Low risk	Chi <sup>2</sup> analysis revealed that there were no significant differences in attrition by condition at any follow-up period
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not provided

**DARE 1991 B**

Methods	Cluster-RCT
Participants	1402 5th and 6th grade students from 20 North Carolina elementary schools (USA) 1988 to 1989 school year
Interventions	<p><b>Experimental:</b> DARE programme was a cognitive, affective and social skills strategies, aimed to increase students' awareness of adverse consequences of drug use, build self esteem, improve decision-making and assertiveness in social settings</p> <p>Social competence approach</p> <p>n = 685:</p> <p>Deliverer: law officer</p> <p>Modality not reported</p> <p>N of sessions: 17 weekly lessons</p> <p>Booster: no</p> <p>Duration of the intervention: 4 months (August 1988 to December 1988)</p> <p><b>Control:</b> usual curricula, n= 585</p>
Outcomes	Self reported use of alcohol, tobacco, marijuana and inhalants, intentions use of these substances, several selected attitudinal variables



**DARE 1991 B** (Continued)

Lifetime use, current use

## Notes

Outcome assessed at post-test (not reported)

Attrition (on overall): 9.4%

Analysis sample n = 1270, n intervention group not reported, n control group not reported

Data suitable for inclusion in meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "schools were randomly assigned to receive DARE project or to be placed in the control condition"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "students were equally likely not be present in the DARE and control schools. There were no consistent patterns indicating that students who did not completed the study were at greater risk for drug abuse"
Similarity of groups at baseline	Low risk	Groups not similar at baseline for some characteristics but adjustment for imbalance was done during the analysis using appropriate methods
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Questionnaires were compiled by participants using an anonym code and in a manner that ensured privacy without access by teachers, parents or project staff

**DARE 2003**

Methods	Cluster-RCT
Participants	6728 7th and 8th grade students from 24 middle and junior schools in Minnesota (USA), 1999 to 2001 school years. 6237 students completed baseline survey
Interventions	<p><b>Experimental:</b> 2 conditions:</p> <ol style="list-style-type: none"> <li>1. DARE only: provided skills in resisting influences to use drugs and in handling violent situations. Its also focused on character building and citizenship skills</li> </ol> <p>Social competence approach</p> <p>n = 2226</p> <p>Deliverer: law officer + teachers</p> <p>Modality not reported</p> <p>N of sessions: 10</p> <p>Booster: no</p> <p>Duration of the intervention: 2 school years</p> <ol style="list-style-type: none"> <li>2. DARE + DARE Plus: DARE Plus had 2 components: the first was a classroom-based, peer-led, parental involvement programme focused on influences and skills related to peers, social groups, media and role models. The second component involved extra school activities</li> </ol>

## DARE 2003 (Continued)

Social competence approach

n = 2221:

Deliverer: law officer + teachers

Modality not reported

N of sessions: 10 sessions implemented by law officer + 4 sessions implemented by teachers

Booster: no

Duration of the intervention: 4 weeks

**Control:** "delayed program", n = 1790 (had the opportunity to receive the DARE Plus programmes in 2001 to 2002, after the final follow-up)

Outcomes	Self reported tobacco, alcohol and marijuana use; multidrug use; violent behaviours among the students, physical victimisation  Past use of alcohol, current use of tobacco
Notes	Outcome assessed at post-test (not reported) Attrition not reported  Analysis sample n = 5239, n intervention group not reported, n control group not reported  No data suitable for inclusion in meta-analysis

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The study design involved 24 middle and junior high schools in Minnesota that were matched on socioeconomic measures, drug use and size, and randomly assigned to 1 of 3 conditions
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	84.0% retention at final follow-up. Reasons for loss to follow-up included students relocating (10.8%), absenteeism (1.4%), parental refusal or non-deliverable consent form (2.3%), student refusal (1.0%), and home schooling, limited English or special education (0.5%). Loss to follow-up rates did not differ by study condition. The main outcomes of the study were analysed using growth curve analyses. This analytic method permits retention of participants who do not have complete data
Similarity of groups at baseline	Low risk	Quote: "At baseline, there were no significant differences between the 3 conditions."
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## DRS 1993

Methods	Cluster-RCT
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**DRS 1993** (Continued)

Participants	465 students from a high school in southwestern USA
Interventions	<p><b>Experimental:</b> Drug Resistance Strategies project was a communicative resistance skills training through film and live performance. The curriculum utilised actual narrative accounts that were performed by actors and couched in a musical drama format. The film curriculum was produced on film and transferred to videotape; the screenplay was then adapted into a live performance format</p> <p>4 experimental conditions:</p> <ul style="list-style-type: none"> <li>- Film only (n = not reported), 2 sessions</li> <li>- Film plus discussion (n = 99), 2 sessions</li> <li>- Live performance (n = not reported), 1 session</li> <li>- Live performance plus discussion (n = not reported), 1 session</li> </ul> <p>Social competence approach</p> <p>n = not reported</p> <p>Deliverer: project staff</p> <p>Modality not reported</p> <p>Booster: no</p> <p>Duration of the intervention: 1 month</p> <p><b>Control:</b> programme not reported, n = 89</p>
Outcomes	<p>Students were pre-tested with a questionnaire containing demographic information, current usage and amount, use of resistance skills, confidence and difficulty of resistance, attitudes, perceived normative support for use of drugs and alcohol, and use of planning to avoid drugs</p> <p>An immediate post-test was administered 1 day after the intervention (both in the intervention and control groups). Follow-up post-test was administered 1 month after the intervention</p>
Notes	<p>Outcome assessed at post-test 1 day after; assessed at follow-up after 1 month</p> <p>Attrition not reported</p> <p>Analysis sample n = 5239, n intervention group not reported, n control group not reported</p> <p>No data suitable for inclusion in the meta-analysis</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: " 21 classes were randomly assigned to one of four intervention conditions and one control condition"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear attrition rate
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## GATEHOUSE 2004

Methods	Cluster-RCT
Participants	2678 students aged 13 to 14 years from 12 metropolitan and 4 country district in Australia, 1997 to 1999 school years. 2678 students completed baseline survey
Interventions	<p><b>Experimental:</b> Gatehouse Project aimed at increase the level of emotional well being and reduce the substance use through: building a sense of security and trust, increasing skills and opportunities for good communication and building a sense of positive regard through valued participation in aspects of school life</p> <p>Social competence approach</p> <p>n = 1335</p> <p>Deliverer: project staff</p> <p>Modality not reported</p> <p>N of sessions: 20</p> <p>Booster: yes</p> <p>Duration of the intervention: 3 months</p> <p><b>Control:</b> n = 1343</p>
Outcomes	<p>Mental health status: reported anxiety/depressive symptoms</p> <p>Social relation: availability of attachment and conflictual relationship</p> <p>Victimisation</p> <p>School engagement</p> <p>Tobacco, alcohol and cannabis use: current use of tobacco and alcohol, past month use of tobacco and past 2 weeks use of alcohol; regular use of tobacco and alcohol; use of cannabis in the previous 6 months</p>
Notes	<p>Outcome assessed at the end of year 8, 9, 10 (12, 24, 36 months after the initiation of the intervention, first surveys at 5 months after the end of intervention)</p> <p>Attrition respectively of 3%, 8% and 10%</p> <p>Analysis sample not reported, n intervention group not reported, n control group not reported</p> <p>Data suitable for inclusion in meta-analysis</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "district were randomly allocated to experimental or control condition. Using simple random sampling 12 school in the metropolitan area and 4 in the country region were selected from the intervention district and 12 and 4 from the control district"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias)	Low risk	Analysis done with the intention-to-treat principle

**GATEHOUSE 2004** (Continued)

All outcomes

Similarity of groups at baseline	Low risk	The intervention group reported only slightly lower levels of risk factors such as parental separation and parental smoking
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**GOOD BEHAVIOR GAME 2004**

Methods	RCT
Participants	678 1st grade students from 9 primary schools in the USA, 1993 school year
Interventions	<p><b>Experimental:</b></p> <p>2 experimental conditions:</p> <ul style="list-style-type: none"> <li>- Classroom-centred intervention: consisted of 3 components: curricular enhancements, improved classroom behaviour management practices, and supplementary strategies for children not performing adequately. An interactive read-aloud component was added to increase listening and comprehension skills</li> </ul> <p>GBG programme involves a whole class strategy to decrease disruptive behaviour and reduce early-onset tobacco smoking</p> <p>n = 192</p> <p>Booster: no</p> <ul style="list-style-type: none"> <li>- Family-school partnership intervention improves achievement and reduces early aggression and shy behaviour by enhancing parent-school communication and providing parents with effective teaching and child behaviour management strategies</li> </ul> <p>n = 178</p> <p>Booster: yes</p> <p>Other approach</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: not reported</p> <p>Duration of the intervention: 1 school year</p> <p><b>Control:</b> standard educational setting, n = 196</p>
Outcomes	Tobacco, alcohol, marijuana, inhalants and other illegal drug use
Notes	<p>Outcome assessed at 5, 6 and 7 years (6th through 8th grades)</p> <p>Attrition at follow-up (6th, 7th, 8th grade): 16%</p> <p>Analysis sample n = 566, 192 intervention group, 178 control group</p> <p>Data suitable for inclusion in meta-analysis</p>

**Risk of bias**
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**GOOD BEHAVIOR GAME 2004** (Continued)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "students were assigned at random to the three designated classrooms with balancing for male-female ratio"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "attrition across follow up period was unrelated to intervention status and participants lost at follow up did not differ from participants with complete data with respect to baseline teacher rating, academic achievement and demographic characteristics."
Similarity of groups at baseline	Low risk	Quote: "we found no statistically significant differences in terms of sociodemographic characteristics across groups"
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Quote: "audio computer assisted self interview (ACASI) methods were used to administer standardized items; the student marked their responses under private conditions that were maintained by a member of the assessment staff, who took care not observe the responding and to prevent observations by the vicinity"

**GOOD BEHAVIOR GAME 2012**

Methods	Cluster-RCT
Participants	19 schools, 41 classrooms, 407 first grade children within 5 urban areas in Baltimore during 1985 to 1986
Interventions	<p><b>Experimental group:</b> 8 GBG classrooms (n = 238)</p> <p>Based on life course/social field theory</p> <p>"The teacher posted basic classroom rules of student behavior, and during a particular game period all teams received a reward if they accumulated four or fewer infractions of acceptable student behavior. The GBG was played during periods of the day when the classroom environment was less structured, such as when the teacher was working with one student or a small group while the rest of the class was instructed to work on assigned tasks independently. Over time, the game was played at different times of the day and during different activities. In this manner, the GBG evolved from a precise procedure that was highly predictable and visible, with a number of immediate rewards, to a procedure with an unpredictable occurrence and location, with deferred rewards."</p> <p>Other approach</p> <p>Deliverer: trained teacher</p> <p>Modality: interactive</p> <p>Duration: 2 years</p> <p>Sessions: 3 per week lasting 10 minutes, increasing to 40 minutes</p> <p>Booster: no</p> <p><b>Control group:</b> no intervention : 6 classrooms (n = 169)</p>
Outcomes	CIDI-UM modified (Composite International Diagnostic Interview - University of Michigan: a scale for occurrence of drug abuse and dependence disorders), to reflect the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) diagnostic criteria, was used to determine the lifetime, past year and past

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**GOOD BEHAVIOR GAME 2012** (Continued)

month occurrence of drug abuse and dependence disorders. Diagnoses were derived in accordance with the DSM-IV criteria, using a computerised scoring algorithm

Notes	Outcome assessed at age 19 to 21 by blinded interviewers
	Attrition 24.1%

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Multilevel randomised design; no further description of sequence generation  Quote: "The first stage of the design involved selecting five distinctly different socio-demographic urban areas in Baltimore. The second stage of the design involved assigning individual children to first grade classrooms within each school so that classrooms were nearly identical before they were assigned to the intervention condition. The third stage of this design was random assignment of classrooms and teachers to intervention condition within each intervention school"
Allocation concealment (selection bias)	Unclear risk	No description of method of allocation concealment
Incomplete outcome data (attrition bias) All outcomes	High risk	24.1% attrition
Similarity of groups at baseline	Low risk	No differences between the GBG and control sample were found
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	The interviewers were masked to the first grade intervention condition

**KACM 1991**

Methods	RCT
Participants	511 students from 4th, 5th and 6th grade from 23 classes of 6 elementary schools in northwest Arkansas (USA), during spring 1989. 501 students completed baseline survey
Interventions	<p><b>Experimental:</b> Keep A Clear Mind Program (KACM) was based on a social skills training model, aimed to help children to develop specific skills to refuse and avoid "gateway" drug use</p> <p>Social competence approach</p> <p>n = not reported</p> <p>Deliverer: project staff + teacher</p> <p>Modality not reported</p> <p>N of sessions: 4</p> <p>Booster: no</p> <p>Duration of the intervention: 1 month</p>



**KACM 1991** (Continued)

**Control:** not reported, n= not reported

Outcomes	Alcohol, tobacco and marijuana use; intentions, beliefs and knowledge
Notes	Outcome assessed at post-test: 2 weeks after the implementation of the programme  Attrition at post-test: 11% Analysis sample n = 490, n intervention group not reported, n control group not reported  No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "students were blocked on school and grade level then randomly assigned by class to either an intervention or control group"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "similar proportions of students completed the post test questionnaire in both groups"
Similarity of groups at baseline	Low risk	Quote: "no significant differences were found between intervention and control group at pretest on the primary variables with one exception: the control group included a great number of black students"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**KEEPIN' IT REAL 2003**

Methods	Cluster-RCT
Participants	6035 7th grade students from 35 middle schools in Arizona, USA. During 1997 to 1998. 4234 students completed baseline survey
Interventions	<b>Experimental:</b> Drug Resistance Strategies Project (DRS) implemented and evaluated in the "Keepin' it REAL curriculum". The curriculum is aimed to develop drug resistance strategies, life skills and decision-making, communication competences, knowledge. 3 parallel versions: a Mexican American centred version (oriented toward Mexican American culture), a Black and White centred version (oriented toward European American and African American culture) and a multicultural version  Social competence approach  n = 25 schools  Deliverer: teacher  Interactive modality  N of sessions: 10 sessions in 7th grade  Booster: yes  Duration of the intervention: 18 months

**KEEPIN' IT REAL 2003** (Continued)

**Control:** already existing substance use prevention programmes, n = 10 schools

Outcomes	Recent substance use (alcohol, tobacco, marijuana). Resistance strategies (alcohol, tobacco, marijuana). Self efficacy. Intent to accept. Positive expectancies. Norms
Notes	Outcome assessed at: post-test after the implementation of the booster (6 months after the initiation of the intervention), 8 months after curriculum implementation and 14 months after curriculum completion Attrition (overall): 7% at post-test, 12% at first follow-up, 16% at second follow-up  Analysis sample n = 4234, n intervention group not reported, n control group not reported  No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The research team stratified the 35 participating public schools according to enrollment and ethnicity (% Hispanic) and then used block randomisation to assign each school to one of 4 conditions (Mexican American, Black/White, multicultural and control; 8, 9, 8 and 10 schools respectively in each condition).
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	The anonymisation process linked 24% of the students over all 4 waves, an additional 22% over 3 waves, and another 19% between only 2 of the waves. Altogether, 55% of the respondents had a pretest questionnaire linked to at least 1 of the post-tests
Similarity of groups at baseline	Low risk	Statistically significant differences in racial and socioeconomic conditions, but data adjusted for baseline characteristics
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**KEEPIN' IT REAL 2008**

Methods	Cluster-RCT
Participants	At baseline, 1566 5th grade students from 23 public middle schools (81 homerooms) in Phoenix, Arizona (USA). School year 2004 to 2006
Interventions	<b>Experimental:</b> keepin 'it REAL (kiR) adapted multicultural curriculum for the 5th grade. The 5th grade version uses the same basic curriculum content as the standard 7th grade multicultural version, differing primarily in communication level/format, the concreteness of the presentation of concepts, and the age-based relevance of the examples. Although the core content of the standard curriculum uses several strategies deemed successful with preadolescent children (narrative, participatory modelling, observational learning and videos), developmental concerns necessitated simplification in language and the complexity of presentation of concepts. Limitations in the cognitive abilities of 5th grade students, specifically their more restricted ability to engage in abstract thinking, systematic reasoning and perspective taking, encouraged changes in presentation format  Social competence approach

**KEEPIN' IT REAL 2008** (Continued)

n = 10 schools

Deliverer: teacher

Interactive modality

N of sessions: 12 sessions in 5th grade, 3 to 6 boosters

Booster: yes

Duration of the intervention: 18 months

**Control:** standard intervention, n = 13 schools

Outcomes	Socio-demographic characteristics Refusal efficacy Substance use resistance strategies  Hypothetical alcohol resistance Students' active decision-making style Intentions to use substances Parents' anti-drug injunctive norms Friends' anti-drug injunctive norms Personal anti-drug norms Descriptive norms Substance use expectancies Lifetime prevalence of alcohol, tobacco, marijuana, inhalants Past month's prevalence of alcohol, tobacco, marijuana
Notes	Outcome assessed at the end of the intervention (12 months follow-up) and at the end of the booster session (18 months) Attrition not reported  Analysis sample n = 1566, n intervention group not reported, n control group not reported  Data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not specified
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	High risk	91% of the students who participated in the baseline assessment also participated at wave 2; and 72% of the students who participated in the baseline assessment also participated at wave 3. Schools reported students transferring out at rates of between 10% and 25% (average transfer out rate of 16%), which accounts for much of the attrition between baseline and wave 3
Similarity of groups at baseline	Low risk	A test of homogeneity of proportions indicated that the 7 student participation patterns did not vary between the 2 study conditions ( $F(3.58, 78.82) = 0.545$ , $P$

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**KEEPIN' IT REAL 2008** (Continued)

value = 0.684). Thus, there does not appear to be evidence of differential participation. Although it is possible that the students in the 2 conditions differed with respect to unobserved characteristics, the data presented in Table 1 suggest that they did not differ with respect to some observed characteristics that have been shown to be correlated with substance use among adolescents

Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified
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**KEEPIN' IT REAL 2010**

Methods	Cluster-RCT
Participants	At baseline 1984 students from 5th grade from 29 public elementary schools in Phoenix, Arizona, 2004 school year
Interventions	<p><b>Experimental:</b> participants were assigned to 6 conditions:</p> <ol style="list-style-type: none"> <li>1. 5th grade kiR-Plus (17 sessions)</li> <li>2. 5th grade kiR-AE (15 sessions)</li> <li>3. 7th grade kiR-Plus (17 sessions)</li> <li>4. 7th grade kiR-AE (15 sessions)</li> <li>5. 5th and 7th grade kiR-Plus</li> <li>6. 5th and 7th grade kiR-AE</li> </ol> <p>The 5th grade versions use the same basic curriculum content as the 7th grade versions, differing primarily in communication level/format, the concreteness of the presentation of concepts and the age-based relevance of the examples. The kiR-Plus versions of the curriculum added 2 lessons on how to deal with increasing responsibility and independence and the general stresses of change and life transitions in the contexts of school, peers and communication with parents. The 2 added lessons of the kiR-AE versions of the curriculum encouraged students to view cultural diversity and ethnic identity as strengths, promoted relevant protective cultural values, examined the impact of language on drug resistance and discussions with parents, and explored the changes in identity and values that may occur through acculturation</p> <p>Social competence approach</p> <p>n = not reported</p> <p>Deliverer: not reported</p> <p>Modality not reported</p> <p>Booster: yes</p> <p>Duration of the intervention: 18 months</p> <p><b>Control:</b> school's regularly scheduled, substance use prevention programme, n = not reported</p>
Outcomes	Lifetime substance use prevalence (alcohol, tobacco, marijuana, inhalants); past month prevalence; intention to use substances; refusal efficacy; hypothetical alcohol resistance; number of substance use resistance strategies; descriptive substance use norms (scales); personal anti-drug norms; positive substance use expectancies (scales)
Notes	<p>Outcome assessed at 8th grade - wave 6, 48 months after (baseline - W1 at the beginning of the 5th grade = fall 2004; 5th follow-up - W6 during 8th grade = winter 2007 to 2008)</p> <p>Attrition not reported</p>

**KEEPIN' IT REAL 2010** (Continued)

Analysis sample n = 1984, n intervention group not reported, n control group not reported

No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Stratified randomisation
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	High risk	Student participation fell to 45% of the original sample by the final assessment, with losses concentrated in 3 of the original 29 schools
Similarity of groups at baseline	Unclear risk	Not specified
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**LST 1984**

Methods	Cluster-RCT
Participants	1311 7th grade students from 10 suburban New York junior high schools, USA. 1185 students completed baseline survey
Interventions	<p><b>Experimental:</b> Life Skills Training Program (LST) is a multicomponent substance abuse prevention programme consisting of 5 major components: cognitive, decision-making, anxiety, managing, social skills training, self improvement, with the following experimental conditions (factorial design):</p> <ol style="list-style-type: none"> <li>1. Substance abuse prevention programme implemented by older students, n = 4 schools</li> <li>2. Substance abuse prevention programme implemented by regular classroom teachers, n = 4 schools</li> </ol> <p>Social competence approach</p> <p>n = 8 schools</p> <p>Deliverer: teacher, peer (older students)</p> <p>Modality: not reported</p> <p>N of sessions: 20 sessions in 7th grade, 10 sessions for booster</p> <p>Booster: yes</p> <p>Duration of the intervention: 2 school years</p> <p><b>Control:</b> not reported, n = 2 schools</p>
Outcomes	Smoking status, problem drinking, marijuana use (ever tried, monthly, weekly, daily), cognitive measures, attitudinal measures, personality measures
Notes	Outcome assessed at: post-test (4 months after the pre-test), 12 months after the implementation of the intervention

**LST 1984** (Continued)

Attrition at post-test: 9.6%. Analysis sample n = 1185  
Attrition at 1-year follow-up: 24%. Analysis sample n = 998

No data suitable for inclusion in the meta-analysis: the absolute numbers of participants in the groups are not given. Authors contacted without reply

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "the 10 schools had been randomly assigned to the five conditions. Two schools were assigned to each experimental condition and two schools were assigned to the control condition"
Allocation concealment (selection bias)	Unclear risk	Information not provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition at post-test: 9.6% Attrition at 1-year follow-up: 24%. Attrition analysis examining the effect of baseline drug use and condition revealed higher attrition among marijuana users and alcohol drinkers at baseline, but no significant condition X pretest use status interaction was found
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**LST 1990**

Methods	Cluster-RCT
Participants	5954 7th grade students from 56 schools in the New York State (USA), fall of 1985 to 1986 school year 4466 students completed baseline survey
Interventions	<p><b>Experimental:</b> Life Skills Training Program: a cognitive-behavioural resistance skills prevention programme, with 3 experimental conditions:</p> <ul style="list-style-type: none"> <li>- E1: 15 class periods in 7th grade + 10 boosters in 8th grade and 5 in the 9th grade, n = 1128 with 1 day formal training of teachers and implementation feedback</li> <li>- E2 like E1 + boosters in 8th grade and 9th grade but with videotape teacher training and no implementation feedback, n = 1327</li> </ul> <p>Social competence approach</p> <p>Deliverer: teacher, project staff</p> <p>Modality: not reported</p> <p>N of sessions: 15 sessions in 7th grade, 10 sessions for booster in 8th grade and 5 in 9th grade</p> <p>Booster: yes</p> <p>Duration of the intervention: 3 school years</p> <p><b>Control:</b> as usual, n = 1142</p>



**LST 1990** (Continued)

Outcomes	Monthly and weekly prevalence of cigarette smoking, alcohol, marijuana and other drugs consumption; knowledge attitude; normative beliefs; skills; psychologic characteristics
Notes	<p>Outcome assessed at: post-test (at the end of the intervention), and at 6 years follow-up (3 years after the end of the intervention)</p> <p>Attrition at post-test: 25%. Analysis sample n = 4466</p> <p>Attrition at post-test: 25%</p> <p>High fidelity (students who received at least 60% of the prevention programme) sample at post-test: n = 3684 (attrition: 38.1%)</p> <p>782 students were excluded from the analysis sample because of failure to meet the inclusion criteria</p> <p>Attrition after 6 years: 39.6%. Analysis sample: n = 3597</p> <p>Attrition of high fidelity sample: 53.8% (analysis sample: n = 2752)</p> <p>The full sample data were used in the meta-analysis</p> <p>Data suitable for inclusion in meta-analysis</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	<p>Quote: "In a randomized block design, schools were assigned to receive one of the three interventions".</p> <p>School were divided in 3 groups on the basis of the geographic area of New York city. Within each area schools were also divided into 3 groups on the basis of cigarette smoking prevalence rates (high, medium or low) and assigned to the experimental conditions within each group and geographic area</p>
Allocation concealment (selection bias)	Unclear risk	Information not provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	<p>25% of the original sample unavailable at 6 years follow-up. Attrition analysis examining the effect of baseline drug use and condition revealed higher attrition among marijuana users at baseline, among students in control condition and among marijuana users in control condition</p> <p>40% of the original sample unavailable at 6 years follow-up. Attrition analysis examining the effect of baseline drug use and condition revealed no differential attrition effect</p>
Similarity of groups at baseline	Low risk	No significant differences for behavioural outcome measures
Blinding of outcome assessment (detection bias) subjective outcomes	High risk	Quote: "students were assessed by questionnaires administered by project staff"

**LST 1994**

Methods	<p>Cluster-RCT</p> <p>6 schools were matched according to demographics and randomly assigned to receive one of 3 interventions</p>
Participants	757 7th grade students from 6 junior high schools in New York (USA), school year not specified

**LST 1994** (Continued)

456 students provided follow-up data in the 9th grade

Interventions	<p><b>Experimental:</b> 2 experimental conditions:</p> <ol style="list-style-type: none"> <li>1. Broad-spectrum life skills training (skill and knowledge-focused; targeted at all students, conducted in classroom setting), n = 321</li> <li>2. Culturally focused intervention (skill-focused only; targeted at high-risk students, conducts in group counselling setting by professionally trained leaders and peers), n = 194</li> </ol> <p>Social competence approach</p> <p>Deliverer: project staff + peer</p> <p>Interactive modality</p> <p>N of sessions: 15 at an average rate of 2 sessions per week in the 7th grade</p> <p>Booster: yes in the 8th grade</p> <p>Duration of the intervention: 18 months</p> <p><b>Control group:</b> information only, n = 124</p>
Outcomes	<p>Marijuana use (assessed on a 9-point scale: never tried, tried but don't use now, less than once a month, about once a month, about 2 or 3 times a month, about once a week, a few times a week, about once a day, more than once a day)</p> <p>Knowledge</p> <p>Intention to use</p>
Notes	<p>Outcome assessed at post-test and at 18 months after the end of the intervention</p> <p>Attrition at post-test: 16%. Analysis sample: n = 639</p> <p>Attrition at follow-up (9th grade): 40%</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Schools were randomly assigned to receive one of the three interventions"
Allocation concealment (selection bias)	Unclear risk	Information not provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition analysis revealed no significant attrition effect on pretest drinking status; there were slightly more attrition among marijuana users in the control intervention
Similarity of groups at baseline	High risk	Culturally focused intervention is targeted only at high-risk individuals, but it is not reported how high-risk was defined; moreover in this case only some of the students in the schools randomised to this intervention should have received the intervention (i.e. the high-risk students) but this information is not provided
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not provided

## LST 2001

Methods	Cluster-RCT
Participants	5222 7th grade students from 29 New York City public schools (USA), school year not specified. 3621 (69%) students completed baseline survey
Interventions	<p><b>Experimental:</b> Drug Abuse Prevention Program, teaching drug resistance skills, anti-drug norms, and facilitating the development of personal and social skills. These skills were taught using a combination of teaching techniques including group discussion, demonstration, modelling, behavioural rehearsal, feedback and reinforcing, and behavioural homework assignments</p> <p>Social competence approach</p> <p>n = 2144</p> <p>Deliverer: teacher</p> <p>Modality: not reported</p> <p>N of sessions: 15 sessions in 7th grade, 10 sessions for booster in the 8th grade</p> <p>Booster: yes</p> <p>Duration of the intervention: 2 school years</p> <p><b>Control:</b> programme that was normally in place at New York City schools, n = 1477</p>
Outcomes	<p>Tobacco, alcohol, marijuana, inhalants use; behavioural intentions; normative expectations; drug attitudes and knowledge; social and personal competence</p> <p>Students provided data at the pre-test and post-test (grade 7), as well as at the 1-year follow-up (grade 8)</p>
Notes	<p>Outcome assessed at: post-test (3 months after the end of the intervention) and 1 year after the end of the intervention</p> <p>Attrition at post-test and follow-up: 30.6%</p> <p>Analysis sample n = 3621, n intervention group not reported, n control group not reported</p> <p>Data for inclusion in the tables were obtained from authors</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Blocked randomised design. Prior to randomisation, schools were surveyed and divided into high, medium, or low smoking prevalence. From within these groups, each of the 29 participating schools were randomised to either receive the intervention (16 schools) or be in the control group (13 schools)"
Allocation concealment (selection bias)	Unclear risk	Information not provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition analysis examining the effect of baseline drug use and condition revealed higher attrition among marijuana users at baseline, and among marijuana users in control condition
Similarity of groups at baseline	Low risk	No significant difference in any substance use variables or gender: there were more black students in the experimental condition and more Hispanic students in the control conditions

**LST 2001** (Continued)

Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not provided
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**LST 2006**

Methods	Randomised pretest and post-test comparative design (it seems that individuals are sample unit)
Participants	170 Thai high school students from grades 7 to 12, years not specified
Interventions	<p><b>Experimental:</b> LST programme provided students with information and skills specifically related to drug and tobacco use, such as the effects of drugs, self awareness skills, decision-making and problem-solving skills, stress and coping skills, and refusal skills</p> <p>Social competence approach</p> <p>n = 85</p> <p>Deliverer: not reported</p> <p>Interactive modality</p> <p>N of sessions: 10</p> <p>Booster: no</p> <p>Duration of the intervention: not reported</p> <p><b>Control:</b> tobacco and drug education curriculum normally provided, n = 85</p>
Outcomes	<p>Knowledge about the health consequences of tobacco and drug use</p> <p>Attitudes toward tobacco and drug use</p> <p>Life skills, refusal, decision-making and problem-solving skills</p> <p>Tobacco and drug use frequency in the past 2 months</p>
Notes	<p>Outcome assessed at: post-test (6 months after the end of the intervention)</p> <p>Analysis sample n = 170, n intervention group not reported, n control group not reported</p> <p>Attrition at post-test not reported</p> <p>No data suitable for inclusion in meta-analysis</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not specified
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not specified

**LST 2006** (Continued)

Similarity of groups at baseline	Low risk	The results revealed no significant differences between the control and the intervention groups at pretest
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**LST and KEPT LEFT 2008**

Methods	Cluster-RCT
Participants	36 public schools from 2 South African provinces, KwaZulu-Natal and the Western Cape, school year not specified. 5266 students completed baseline survey.
Interventions	<p><b>Experimental :</b> Keep Left South African version and Life Skill Training South African version: decision-making framework, stress management, resisting peer pressure</p> <p>Social competence approach</p> <p>Group 1: Keep Left South African version; n = 12 schools, 1978 students</p> <p>-Group 2: LST South African version; n = 12 schools, 1717 students</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N of sessions: 16 sessions for Keep Left and 16 sessions for LST</p> <p>Booster: no</p> <p>Duration of the intervention: 2 school years (8th grade and 9th grade)</p> <p><b>Control:</b> usual tobacco and substance use education, n = 12 schools, 1571 students</p>
Outcomes	The primary outcome was past month use of cigarettes; secondary outcomes were: daily marijuana and hard drug use, daily binge drinking
Notes	<p>Outcome assessed at: post-test 1 (after 1 year, at the end of the 8th grade) and at post-test 2 (after 2 years, at the end of the 9th grade)</p> <p>Attrition at post-test not reported</p> <p>Analysis sample at post-test 2 n = 3267, n intervention group at post-test 2 = 2256, n control group at post-test 2 = 1011</p> <p>Data suitable for inclusion in meta-analysis</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Schools were then randomly selected within each ethnicity, size and SES strata. The target sample was 36 or 12 per experimental group
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias)	High risk	Students completed questionnaires on 3 occasions: (1) baseline at the beginning of 8th grade, (2) post-test 1 at the end of 8th grade, and (3) post-test 2

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## LST and KEPT LEFT 2008 (Continued)

All outcomes

at the end of 9th grade. For the 2 post-test assessments, only individuals who were in the school at the beginning of grade 8 and who completed the baseline evaluation were asked to complete questionnaires. Thus, there was selective attrition in the study

Similarity of groups at baseline	Low risk	At baseline, the 3 intervention groups did not differ on any of the socio-demographic or substance use variables
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## MOTIVATIONAL INTERV 2011

Methods	Cluster-RCT
Participants	416 students aged 16 to 19 years old recruited in 12 London Further Education colleges without regard to substance use status. The response was encouraging with 12 out of 21 colleges approached agreeing to participate. Age 16 to 19 years was adopted as the sole inclusion criterion, and there were no formal exclusion criteria
Interventions	<p><b>Experimental:</b> motivational Interview: highly individualised intervention. Its aim is to help the participant explore their own behaviour. Particular emphasis is given to perceptions of risk and problem recognition, concerns and consideration of change, and also to the activity of the practitioner in directing attention towards the resolution of ambivalence</p> <p>Deliverer: not reported</p> <p>Interactive modality</p> <p>N of sessions: 1</p> <p>Booster: no</p> <p>Duration of the intervention: 1 hour</p> <p><b>Control group:</b> "Drug Awareness" (DA): 16-question quiz on the effects of cigarette smoking, alcohol consumption and cannabis use, followed by further discussion components and the provision of leaflets giving accurate information on the effects of target drugs</p>
Outcomes	Prevalence, initiation and cessation rates for cannabis use
Notes	<p>Outcome assessed at 3 and 12 months follow-up</p> <p>Attrition: 3 months: 11%, 12 months: 16.5%</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Computerised randomisation was undertaken by the local Clinical Trials Unit and decisions were communicated by telephone to researchers after recruitment and baseline data collection on an individual college basis to preserve allocation concealment. We stratified allocation by college, so that equivalent numbers of groups recruited from any one college would be allocated to each study condition."

**MOTIVATIONAL INTERV 2011** (Continued)

Allocation concealment (selection bias)	Low risk	Quote: "Computerised randomisation was undertaken by the local Clinical Trials Unit and decisions were communicated by telephone to researchers after recruitment and baseline data collection on an individual college basis to preserve allocation concealment. We stratified allocation by college, so that equivalent numbers of groups recruited from any one college would be allocated to each study condition."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was not differential between the study groups
Similarity of groups at baseline	Low risk	Randomisation successfully created baseline equivalence between groups
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**NAPA 1984**

Methods	RCT Social study classes were paired on pre-test attitudes toward and involvement in alcohol, cigarette and marijuana use; 1 class in each pair was then randomly assigned to receive the drug education course. Students were used as unit of analysis
Participants	473 students from 7th and 9th grade attending 2 junior high schools in a suburban community in Northern California (USA), during second semester of the academic year 1980 to 1981. 399 students completed baseline survey
Interventions	<b>Experimental:</b> Napa Project focus on motivation and decision-making skills, personal goals, assertiveness, knowledge  Social competence approach  n = 237  Deliverer: project staff  Interactive modality  N of sessions: 12 sessions from February through May 1981  Booster: no  Duration of the intervention: 4 months  <b>Control:</b> programme that was normally in place at New York City schools, n = 236
Outcomes	Any drug  Drug knowledge, general drug attitude, alcohol benefits, pot benefits, alcohol costs, pot costs, soft attitudes, soft peer attitudes, soft peer use, alcohol involvement, cigarette involvement, pot involvement, pill benefits, pill cost, hard peer attitude, hard peer use, hard attitude
Notes	Outcome assessed at: post-test (May 1981, at the end of the intervention) and at 5 months (October 1981) Attrition (on overall): 15%  Analysis sample n = 352, n intervention group not reported, n control group not reported



## NAPA 1984 (Continued)

No data suitable for inclusion in the meta-analysis

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "classes were paired on pretest attitudes and involvement in alcohol, cigarette and marijuana use. One class in each pair was then randomly assigned to receive the experimental intervention and the other to the control group"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Information not reported
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

## PATHS 2012

Methods	Cluster-RCT
Participants	7846 participants, first 3 years of 48 schools (24 experimental and 24 control), Hong Kong
Interventions	<p><b>Experimental intervention:</b> Positive Adolescent Training through Holistic Social Programmes. There are 2 tiers of programmes in the Project PATHS. Both tiers are developed with reference to 15 positive youth development constructs, including bonding, resilience, social competence, recognition of positive behaviour, emotional competence, cognitive competence, behavioural competence, moral competence, self determination, self efficacy, clear and positive identity, beliefs in the future, prosocial involvement, prosocial norms and thriving. An important feature of the Project PATHS is its systematic evaluation approaches (e.g. interim evaluation, focus group interview, survey on subjective and objective outcomes, programme implementers' evaluation, student weekly diary, etc.), which enable researchers to examine the effectiveness of the programme thoroughly= (n = 4049)</p> <p>Other approach</p> <p>Deliverer: teacher and social worker</p> <p>Interactive</p> <p>Number of sessions: 120 (40 every school year)</p> <p>Booster: only a parallel tier 2 programme for students with special needs</p> <p>Duration of intervention: 36 months</p> <p><b>Control group:</b> not described; n = 3797</p>
Outcomes	Use of drugs: composite score of illegal drug use (ketamine, cannabis, ecstasy, heroine) Likert scale (0 to 7)
Notes	Process evaluation year 1 to 3 (wave 1 to 6). 3 and 12 months after the end (wave 7, 8)

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## PATHS 2012 (Continued)

Attrition

Wave (W) 1, W2, W3, W4, W5, W6, W7, W8

Experimental: 4049, 3734, 3174, 2999, 3119, 3006, 2879 (71%), 2852 (70%)

Control: 3797, 3654, 3765, 3698, 3757, 3727, 3669 (96%), 3640 (96%)

No data suitable for meta-analysis

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Eighty schools, representative of schools in the three region areas, were randomized to either control or intervention arm. Five schools (6.3%) from the control arm withdrew before the baseline survey and were not replaced. There were no differences found between the schools that withdrew and participating schools."
Allocation concealment (selection bias)	Unclear risk	Quote: "Eighty schools, representative of schools in the three region areas, were randomized to either control or intervention arm. Five schools (6.3%) from the control arm withdrew before the baseline survey and were not replaced. There were no differences found between the schools that withdrew and participating schools."
Incomplete outcome data (attrition bias) All outcomes	High risk	High attrition in the experimental group (30%) and unbalanced (only 4% in the control group)
Similarity of groups at baseline	Unclear risk	Quote: "With schools being the units of analysis, results indicated that the 19 experimental schools and 24 control schools did not differ in school characteristics in terms of banding (i.e., categorizing based on students academic competence), geographic district, religious affiliation, sex ratio of the students, and source of funding. At the individual level, preliminary analyses showed that there were no statistically significant differences between the 2 groups in all sociodemographic background characteristics of the students ( $P > 0.05$ ), but age. The mean age of the control group was higher than that of the experimental group."  Data not reported for substance use at baseline
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## PAY 1984

Methods	RCT
Participants	283 junior and senior high school students (volunteers) from the public schools of Milwaukee, Wisconsin (USA). 1979 to 1980 and 1980 to 1981 school years
Interventions	<b>Experimental:</b> PAY programme (Positive Alternatives for Youth), aimed to increase alternatives to drug abuse, such as personal awareness, interpersonal relations, self reliance development, vocational skills, aesthetic and intellectual experiences, social-political involvement, sexual expression, meditation, spiritual-mystical experiences and creative experiences

## PAY 1984 (Continued)

Social competence approach

n = 160

Deliverer: project staff and teacher

Interactive modality.

N of sessions: 48 sessions during 2 school years (1979 to 1980 and 1980 to 1981)

Booster: no

Duration of the intervention: 6 months

**Control:** no treatment, n = 123

Outcomes	Drug and alcohol use, activities participation, feelings and remedies, marijuana and alcohol involvement, attitudes and perceptions of one's social skills, peer pressure resistance, self esteem, future orientation, stress management, attitudes towards drugs and alcohol, responsible use, activity attitudes
Notes	<p>Outcome assessed at: post-test 1 (during the spring semester of 1980) and at post-test 2 (at the end of the programme, during the spring semester of 1980)</p> <p>Analysis sample at post-test 2 n = 105, n intervention group 58, n control group 50</p> <p>Attrition at post-test (first year): 14.4% for the experimental group, 10.9% for the control group</p> <p>Attrition at post-test (second year): 17.1% for the experimental group, 15.2% for the control group</p> <p>No data suitable for inclusion in the meta-analysis</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "students were randomly assigned to either the PAY alternative classes or to a no treatment control group"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Drop-out balanced in numbers across intervention groups but reasons for dropping out and characteristics of students who dropped out compared with characteristics of students who remained are not reported
Similarity of groups at baseline	Unclear risk	Information not reported, apart from sex and ethnicity
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Questionnaires were compiled by participants using an anonym code and in a manner that ensured privacy without access by teachers, parents or project staff

## POSITIVE ACTION 2009

Methods	Matched-pair, cluster-randomised, controlled design,
Participants	1714 first or second grade children at baseline from 20 public elementary (kindergarten to 5th or 6th grade) schools on 3 Hawaiian islands. Our study followed students who were in 1st or 2nd grade at baseline (the 2001 to 2002 academic year) and who stayed in the study schools through 5th grade (the

**POSITIVE ACTION 2009** (Continued)

2005 to –2006 academic year for the first grade cohort, and the 2004 to 2005 academic year for the second grade cohort)

Interventions	<p><b>Experimental:</b> the Positive Action programme is a multicomponent school-based social and character development programme designed to improve academics, student behaviours and character. Lessons are grouped into 6 major units: self concept, mind and body positive actions (e.g. nutrition, physical activity, decision-making skills, motivation to learn), social and emotional actions for managing oneself responsibly (e.g. emotion regulation, time management), getting along with others (e.g. empathy, respect, treating others as one would like to be treated), being honest with yourself and others, and self improvement (e.g. goal-setting, courage to try new things, persistence)</p> <p>Social competence approach</p> <p>10 schools, N = 976</p> <p>Deliverer: teacher</p> <p>Interactive modality</p> <p>N. of session: 140 per year over 5 years (total 700)</p> <p>Booster: yes</p> <p><b>Control:</b> business as usual</p> <p>10 schools , N = 738</p>	
Outcomes	Lifetime prevalence of substance use, self reported (N = 1714) and observed by teacher (N = 1225) (yes/no and scale)	
Notes	Outcome assessed at post-test	
	Attrition: not reported	
<b>Risk of bias</b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Random sequence generation (selection bias)	Low risk	Stratified randomisation
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	High risk	Students who left study schools during the study period were dropped from the study, and students who joined study schools during the study period were added to the study (without collecting baseline data). Thus, our study also included students who entered the schools at any year during the course of the study and who were in 5th grade at the end of the study
Similarity of groups at baseline	Low risk	No significant differences (P value ≥ 0.05) were observed between reports from control and intervention schools, indicating baseline equivalency among all schools in the study
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## PROJECT ACTIVE 2011

Methods	RCT
Participants	Of the 512 adolescents recruited into the study (students attending 2 public high schools in northeast Florida during fall 2008), 93.6% (n = 479) participated in the baseline data collection, with 19 students grade-ineligible and 14 students absent from school
Interventions	<p><b>Experimental:</b> Project Active</p> <p>9-item life skills screen assessing target health behaviours, a one-on-one consultation with slides presenting positive image feedback tailored to screen results, a set of concrete behavioural recommendations for enhancing future fitness, and a personal fitness goal-setting and commitment strategy linking positive image attainment with specific health behaviour change. Intervention content and strategies were based on the Behaviour-Image Model (n = 237)</p> <p>Deliverer: not reported</p> <p>Passive modality</p> <p>N of sessions: 1</p> <p>Booster: no</p> <p>Duration of the intervention: 1 hour</p> <p><b>Control group:</b> 15-page booklet titled: "What Everyone Should Know ABOUT WELLNESS", which included information and illustrations about smoking, alcohol and drug use avoidance, exercise types and benefits, eating nutritious foods, managing stress, getting adequate sleep and maintaining a positive attitude (n = 242)</p>
Outcomes	Frequency and quantity of marijuana use, scored as 30-day frequency (ranging from 1 = 0 days through 11 = 28 to 30 days) and 30-day quantity (ranging from 1 = 0 marijuana times used per day through 12 = 31 or more times using marijuana)
Notes	<p>Outcome assessed at 3 months follow-up</p> <p>Attrition: 6%</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A randomised controlled trial was conducted using a within-school design at 2 schools. Participants were randomly assigned to either the brief intervention or standard care control group by computer-generated random numbers stratified on baseline drug use (30-day alcohol, cigarette and/or marijuana drug use versus non-use)
Allocation concealment (selection bias)	Low risk	Computer-generated random numbers
Incomplete outcome data (attrition bias) All outcomes	Low risk	Most participants (94.1%) successfully completed the post-intervention data collection. Of those lost to follow-up, 24 participants (85.7%) moved away from school and 4 (14.3%) were lost due to repeated absence from school, resulting in a total of 451 participants. No differences were found in the proportion of those who dropped out between treatment groups or participating schools
Similarity of groups at baseline	Low risk	No differences were found for any of the socio-demographic or target health behaviour measures between treatment groups at baseline

## PROJECT ACTIVE 2011 (Continued)

Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified
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## PROJECT CHARLIE 1997

Methods	RCT
Participants	140 students attending a school in Hackney (London), aged 7 to 10 years, school year not specified. 120 students completed baseline survey
Interventions	<p><b>Experimental:</b> Project CHARLIE (Chemical Abuse Resolution Lies in Education) is based on lessons focused on increase of self esteem, decision-making power, resistance skills and knowledge,</p> <p>Social competence approach</p> <p>n = 65 students</p> <p>Deliverer: teacher</p> <p>Modality: not reported</p> <p>N of sessions: 40 sessions during 2 school years (1979 to 1980 and 1980 to 1981)</p> <p>Booster: no</p> <p>Duration of the intervention: 12 months</p> <p><b>Control:</b> no intervention, n = 55 students</p>
Outcomes	Resistance and decision-making skills Self esteem Knowledge Intention to use and substance use including tobacco and alcohol
Notes	<p>Outcome assessed at post-test (at the end of the intervention)</p> <p>Analysis sample at post-test 2 n = not reported, n intervention group not reported, n control group not reported.</p> <p>Attrition: 10.9% in the intervention group  Attrition: 17.9% in the control group. Risk of cross-contamination because only 1 school was included for each arm</p> <p>Data suitable for inclusion in meta-analysis</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "all the children attending the selected two forms entry junior school were randomly selected to receive the Project Charlie"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias)	Unclear risk	Reasons for drop-out not reported

## PROJECT CHARLIE 1997 (Continued)

All outcomes

Similarity of groups at baseline	Low risk	No significant differences in socio-demographic characteristics between groups
Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Quote: "pre and post-testing was carried out by one of the authors with no involvement in the teaching of Project Charlie and commissioned to carry out the independent evaluation"

## PROJECT SPORT 2005

Methods	RCT
Participants	A total of 604 participants, 335 9th grade and 269 11th grade students from a suburban high school in northeast Florida, participated in this study
Interventions	<p><b>Experimental:</b> Project Sport</p> <p>The project consisted of a brief consultation and in-person health behaviour screen, a one-on-one consultation, a take-home fitness prescription targeting adolescent health promoting behaviours and alcohol use risk and protective factors, and a flyer reinforcing key content provided during the consultation mailed to the home. These brief prevention technologies and strategies are based on the Integrative Behavior-Image Model (BIM), which asserts that positive personal and social images serve as both key motivators for health development, and the glue for unifying health promoting and health risk habits within single interventions (n = 302)</p> <p>Deliverer: project staff</p> <p>Passive modality</p> <p>N of sessions: 1</p> <p>Booster: no</p> <p>Duration of the intervention: 1 day</p> <p><b>Control group:</b> minimal intervention consisting of a wellness brochure provided in school and a pamphlet about teen health and fitness mailed to the home (n = 302)</p>
Outcomes	Drug use behaviours measured included 30-day frequency of cigarette smoking and marijuana use, paralleling the alcohol frequency measure. Similarly, measures of cigarette and marijuana stage of initiation were taken, which also corresponded to the measure of alcohol use initiation. Mediators evaluated only for alcohol
Notes	<p>Outcome assessed at 3 and 12 months after the end of the intervention</p> <p>Attrition: 15% at 12 months</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A randomised controlled trial was conducted, with participating students randomly assigned within grade levels (9th and 11th grades) by computer to either the intervention or control group



## PROJECT SPORT 2005 (Continued)

Allocation concealment (selection bias)	Low risk	A randomised controlled trial was conducted, with participating students randomly assigned within grade levels (9th and 11th grades) by computer to either the intervention or control group
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition analyses showed that at 12-month follow-up, 85% of the sample was successfully maintained (n = 514), with comparable numbers of missing adolescents equally distributed across the intervention (n = 42) and control (n = 48) groups. A comparison of participants who dropped from the study in each group at 12-months was conducted using baseline data. No differences were found between drop-outs in the 2 groups on any of the alcohol and drug consumption measures, or exercise behaviour measures. Also, no differences were found between drop-outs by group on any of the socio-demographic measures with one exception regarding parental alcohol use
Similarity of groups at baseline	Low risk	No differences were found on any of the socio-demographic measures between groups with one exception. A greater proportion of control adolescents (42.7%) reported a family alcohol or drug problem, than intervention adolescents (34.9%), $\chi^2 = 3.89$ , 1 df, P value = 0.05
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## REHEARSAL PLUS 1990

Methods	RCT Children were randomly assigned to 1 of the 3 experimental conditions
Participants	42 3rd grade children in a public school in a rural community of southwestern Virginia (USA)
Interventions	<p><b>Experimental:</b></p> <p>1. Rehearsal-plus. Children were taught specific drug refusal techniques and appropriate social skills, and were provided a rationale for each response (n = 15)</p> <p>Social influence approach</p> <p>2. Children in the traditional condition received instruction derived from a "Just to say no" drug programme, based on discussions about peer pressure situations, different ways of saying no and informal practice (n = 15)</p> <p>Social influence approach</p> <p>Deliverer: project staff</p> <p>Interactive modality</p> <p>N of sessions: 2</p> <p>Booster: no</p> <p>Duration of the intervention: 2 days</p> <p><b>Control group:</b> members received more formalised lecture and discussion-based instruction on drug abuse, without discussing the subject of peer pressure (n = 12)</p> <p>Knowledge-based approach</p>
Outcomes	Knowledge

**REHEARSAL PLUS 1990** (Continued)

Notes Outcome assessed at post-test

Short-term evaluation  
Attrition: 0%

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "children were randomly assigned to one of three experimental conditions"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**REHEARSAL PLUS 1993**

Methods	RCT
Participants	74 3rd grade children from a primarily lower middle-class neighbourhood attending an elementary school in southwestern Virginia (USA), school year not specified
Interventions	<p><b>Experimental:</b></p> <p>Students were randomly assigned to 1 of 3 conditions</p> <ul style="list-style-type: none"> <li>- Rehearsal-plus condition (R+): children were taught drug knowledge, assertiveness skills, decision-making skills, rationale and specific drug refusal skills in the context of a skills-based strategy, n = 24</li> <li>- General information (GI) condition: children were taught the same components at a more global level with the exception of rationale, n = 24</li> </ul> <p>Deliverer: psychology majors</p> <p>Interactive modality</p> <p>N of sessions: 3</p> <p>Booster: no</p> <p>Duration of the intervention: 3 days</p> <p><b>Control:</b> children received drug education only after they received post assessment, n = 26 students</p>
Outcomes	Decision making, rationale, drug knowledge, assertiveness, general knowledge and behavioural skills
Notes	Outcome assessed at post-test (at the end of the intervention) and at follow-up (4 weeks after the intervention, only participants in experimental conditions)

**REHEARSAL PLUS 1993** (Continued)

Analysis sample at post-test n = 57, n intervention group = R+ 22, GI 16, n control group = 19

Attrition: 23%: 8.3% in group A, 30% in group B, 27% in group C

Data suitable for inclusion in meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "subjects were randomly assigned to one of three groups"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Significant differences in drop-out across groups
Similarity of groups at baseline	Low risk	Multivariate analysis of pretest variables revealed no significant differences between groups
Blinding of outcome assessment (detection bias) subjective outcomes	High risk	Quote: "ten psychology majors who served as trainers and 11 others who served as assessors were responsible for teaching drug education in the experimental condition"

**REHEARSAL PLUS 1995**

Methods	RCT Children were randomly assigned to 1 of the 3 experimental conditions
Participants	34 3rd grade children from a primarily lower middle-class neighbourhood attending an elementary school in a rural community of southwestern Virginia (USA), school year not specified
Interventions	<b>Experimental:</b>  Students were randomly assigned to 1 of 3 conditions: - Rehearsal-plus condition: children were taught drug knowledge, assertiveness skills, decision-making skills, rationale and specific drug refusal skills in the context of a skills-based strategy, n = 14 - General information condition: children were taught the same components with the exception of rationale; additionally, they received training in general knowledge/self esteem, n = 12  Social competence approach  Deliverer: psychology majors  Interactive modality  N of sessions: 3  Booster: no  Duration of the intervention: 3 days  <b>Control:</b> no training, n = 8 students
Outcomes	Decision making, rationale, drug knowledge, assertiveness, general knowledge and behavioural skills

**REHEARSAL PLUS 1995** (Continued)

Notes	Outcome assessed at post-test (at the end of the intervention)
	Analysis sample at post-test not reported, n intervention group not reported, n control group not reported
	Attrition: 0%
	Data suitable for inclusion in meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "children were randomly assigned to one of three experimental condition"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No loss to follow-up
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**Sexter 1984**

Methods	RCT One 6th of the students were assigned at random to the control group in each programme, being later combined in analysis Hierarchical multiple regressions were used to associate prevention models with outcomes
Participants	1575 students, 5th grade through 9th grade; New York, USA. September 1980 to June 1981
Interventions	<b>Experimental:</b> 5 broad categories of prevention programmes were analysed (1) Humanistic education model: prevention programmes using activities designed to clarify values and stimulate thought, opinion making and decision-making  Social competence focused, n = 260 (2) Peer group model: programmes focused on group formation, problem-solving and risk-taking  Social competence focused, n = 377 (3) Parent effectiveness model: programmes devoting major resources to teach parents more effective parenting styles and to improve communication between parents and children, n = 162 (4) Network model: prevention groups built around shared common problems and drew upon members' resources to support each other  Other type of intervention, n = 433 (5) Advocacy model: programmes focused on providing information to aid in solution of problems (knowledge-focused programme), n = 44  Deliverer: not reported

**Sexter 1984** (Continued)

Modality: passive for the knowledge-focused, not reported for the other types of interventions

N of sessions: not reported

Booster: no

Duration of the intervention: 6 months

**Control group:** n = 299

Outcomes	Alcohol, marijuana, psychedelics, CNS stimulants, CNS depressants, glue, solvents and spray abuse were assessed using a modified version of the New York State survey of substance abuse, the Periodic Assessment of Drug Abuse among Youth
Notes	Outcome assessed at post-test  Attrition: not reported  No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "One-sixth of students were then assigned at random to the control group in each program. Control students from all programs were combined in analysis, to form one cross-model control group. This procedure resulted in random assignment to prevention and control condition within each model but not across model. Random assignment to program was not an option open to researchers "
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Information not reported
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjectiveoutcomes	Unclear risk	Information not reported

**Sigelman 2003**

Methods	RCT Children were randomly assigned to 4 intervention groups, within each of the 19 same grade groupings ANOVA and ANCOVA analysis, correcting for correlations between pre-test and post-test, were performed to evaluate the curriculum effect. In the paper the 3 experimental groups were pooled, however we used for the inclusion in the meta-analysis data for the tobacco myths group versus control (data obtained from authors)
Participants	363 students, 3rd grade through 6th grade, from 24 classrooms in 4 metropolitan Catholic schools, USA. School year not specified
Interventions	<b>Experimental:</b> 4 knowledge-focused curricula were implemented

**Sigelman 2003** (Continued)

- (1) Basic: designed to teach how drugs have their effects (n = not reported)  
 (2) Biologically enhanced: basic plus additional information about nervous and circulatory system.(n = not reported)  
 (3) Tobacco myths: basic plus additional segment on short- and long-term effects of tobacco use and differences among alcohol, cocaine and tobacco effects (n = not reported)  
**Control group:** information about flu and chicken pox transmission, prevention and treatment (n = not reported)

Each child listened to the assigned curriculum on a personal tape recorder, using headphones, while following along in a workbook. One researcher was randomly assigned to oversee each group

Knowledge-based approach

n = not reported

Deliverer: project staff

Passive modality

N of sessions: 3

Booster: no

Duration of the intervention: 3 days

Outcomes	Knowledge about dangerous effect of cocaine; intention to use cocaine General biological background knowledge scales and parallel scales measuring knowledge, attitudes and intentions regarding alcohol and cocaine were created; 32 scales were constructed
Notes	Outcome assessed 10 days after the intervention  Attrition at post-test: 7.2%. Analysis sample n = 337 Data for inclusion in the tables were obtained from authors

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Children were randomly assigned to four intervention groups, within each of the 19 same grade groupings."
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Information not reported but attrition rate is low
Similarity of groups at baseline	Low risk	Quote: "chi square analysis indicated no association between curriculum group and sex, grade or ethnicity. One way ANOVAs indicated no significant differences among the four curriculum groups in family socioeconomic index and mother's education"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**SKILLS FOR ADOL 2002**

Methods	Cluster-RCT: schools are the unit of assignment
Participants	34 middle schools (n = 7426 consented 6th graders, 71% of the eligible population) were recruited from 4 school districts in 3 major metropolitan areas of the USA during the fall and winter of 1997 to 1998
Interventions	<p><b>Experimental:</b> Lions-Quest 'Skills for Adolescence' (SFA) utilises a comprehensive array of strategies to teach social competency and refusal skills</p> <p>Social competence approach</p> <p>Deliverer: teacher</p> <p>n = not reported</p> <p>Modality: not reported</p> <p>N of sessions: 40 sessions during 7th grade</p> <p>Booster: no</p> <p>Duration of the intervention: 12 months</p> <p><b>Control:</b> standard interventions, n = not reported</p>
Outcomes	<p>Tobacco, alcohol and illegal drug use prevalence rates</p> <p>Behavioural intentions, social influences, interpersonal perceptions, perception of harmful effects of drugs, and communication skills and self efficacy around drug use refusal</p> <p>The main focus of this report is the change in prevalence of substances used over the 1-year study interval from baseline through the end of the intervention year</p>
Notes	<p>Outcome assessed at post-test (at the end of the intervention) and at 12 months after the end of the intervention</p> <p>Analysis sample at post-test = 6239, n intervention group not reported, n control group not reported</p> <p>No data suitable for meta-analysis</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	School districts and middle schools were recruited via a 2-stage cluster sampling plan
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Low risk	Outcome analyses were conducted using a conservative 'intent to treat' approach, i.e. students in each condition were retained in the analyses based on their 7th grade school assignment and without regard to amount of programme exposure
Similarity of groups at baseline	Low risk	The baseline analysis indicated an overall 30-day prevalence rate of 14% for a composite measure of 'any drug use' (no/yes) and that the 17 SFA and the 17 control schools were equivalent with respect to self reported drug use prior to the 7th grade SFA intervention programme (14% versus 14%)
Blinding of outcome assessment (detection bias)	Low risk	With few exceptions, the data collectors were blind to each school's treatment condition



**SKILLS FOR ADOL 2002** (Continued)  
subjectiveoutcomes

**SMART 1988**

Methods	Cluster-RCT
Participants	2863 7th grade students from 44 junior high school complexes in the Los Angeles Unified School District (USA) Academic year 1982 to 1983
Interventions	<p><b>Experimental 1:</b> Project SMART (Self Management and Resistance Training). Affective curriculum. The affective programme focused on personal decision-making, values clarification and stress management techniques (n = not reported)</p> <p>Social competence approach</p> <p><b>Experimental 2:</b> Project SMART (Self Management and Resistance Training). Social skills curriculum. The social skills programme included teaching students about the various sources of social pressure to use drugs, techniques for resisting them and role-play opportunities for practising the resistance techniques (n = not reported)</p> <p>Social influence approach</p> <p>Deliverer: teacher and project staff + peer leader assistant</p> <p>Interactive modality</p> <p>N of sessions: 12</p> <p>Booster: no</p> <p>Duration of the intervention: not reported</p> <p><b>Control condition:</b> no intervention (n = not reported)</p>
Outcomes	<p>Pre- and post-test data were collected using specific questionnaires and by the collection of saliva specimens</p> <p>Marijuana use: lifetime use, 30 days use, 7 days use, customary use</p> <p>Post-test was administered 12 and 24 months later</p>
Notes	<p>Outcome assessed at 12 and 24 months after the initiation of the intervention</p> <p>No data suitable for inclusion in the meta-analysis: the absolute numbers of participants in the groups are not given Authors contacted: data no longer available</p> <p>Attrition at 12 months:</p> <ul style="list-style-type: none"> <li>- Social: 37%</li> <li>- Affective: 30%</li> <li>- Control: 39%</li> </ul> <p>Attrition at 24 months:</p> <ul style="list-style-type: none"> <li>- Social: 60%</li> <li>- Affective: 37%</li> <li>- Control: 60%</li> </ul>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "schools were randomly assigned to experimental or control conditions using a multi attribute approach to enhance comparability"

**SMART 1988** (Continued)

Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "there was differential attrition by condition at first follow-up assessment ( $p: 0.008$ ) and at the final follow-up ( $p < 0.0001$ ). However the differential attrition among conditions appears to be mitigated by the fact that this attrition was not related to substance use"
Similarity of groups at baseline	High risk	Quote: "there were significant differences between social curriculum and control subjects in alcohol use and tobacco use but not for marijuana"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**SMART 1991**

Methods	Cluster-RCT Schools were stratified by size, test scores and ethnic composition and randomly assigned to receive 1 of 4 intervention programmes In the first paper a general linear model analysis was used using classrooms as unit of analysis. In the second paper the analysis was repeated using a combination of multilevel strategies and ordinary least-squares analysis to take into account of the discrepancy between unit of analysis and unit of randomisation
Participants	3027 7th grade students from 12 junior high school in Los Angeles and Orange Counties, California (USA). School year 1987 to 1988
Interventions	<p><b>Experimental:</b> 3 experimental conditions: 1. Resistance Training (RT): the programme consisted of lessons about the knowledge of consequences of using substances plus lessons focused identifying and resisting peer pressure to use alcohol and drugs, <math>n = 33</math> classrooms</p> <p>Social competence approach 2. Normative Education (NE): the programme included lessons about the consequences of using substances plus lessons about erroneous perceptions of peer drug use, trying to establish a conservative normative school climate regarding substance use, <math>n = 27</math> classrooms</p> <p>Social influence approach 3. Combined: the programme consisted of lessons about information, lessons teaching resistance skills and lessons establishing conservative norms, <math>n = 26</math> classrooms</p> <p>Deliverer: project staff</p> <p>Interactive modality</p> <p>N of sessions: 9</p> <p>Booster: no</p> <p>Duration of the intervention: not reported</p> <p><b>Control group:</b> information (ICU) on social and health consequences of using alcohol and other drugs: knowledge-focused, <math>n = 32</math> classrooms</p> <p>Number of sessions: 4</p>

**SMART 1991** (Continued)

Outcomes	Marijuana (lifetime use; past 30 days use)
Notes	Outcome assessed at 1 and 2 years after initiation of the intervention  Attrition: 22% at 1-year follow-up Analysis sample n = 2370 Attrition: 46% at 2 years follow-up No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "schools were stratified by size, tests scores and ethnic compositions and then randomly assigned to receive one of the four interventions"
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Information about distribution of drop-out from the study across groups not reported
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**TCYL 2009**

Methods	Cluster-RCT  A multilevel or hierarchical logistic model was used to adjust for the intra-cluster correlation and to describe attrition
Participants	19,220 7th grade students from 83 schools from 6 metropolitan areas in the USA. Academic year not specified. Included in the study only the 17,300 students for which baseline data were available
Interventions	<b>Experimental:</b> Take Charge of Your Life Program (TCYL): focused on demonstrating to students that there are personal, social and legal risks and consequences of alcohol, tobacco and marijuana use, that the belief that "everybody does it" are not congruent with reported usage data from national studies. The programme also provided students with life skills such communication, decision-making, assertiveness and refusal skills  Combined (social influence + social competence) approach  n = 10,028  Deliverer: project staff  Interactive modality  N of sessions: 10 lessons in 7th grade and 7 in 9th grade  Booster: yes

**TCYL 2009** (Continued)

Duration of the intervention: overall over 2 school years, n of months not reported

**Control group:** no intervention, n = 7302

Outcomes	Substance use: marijuana use for the 30 days and 12 months prior to survey	
Notes	Outcome assessed at post-test, 12 and 24 months after the end of the intervention Attrition at post-test: 1%, at 9th grade post-test: 35%, at 2 years follow-up: 47%	
<b><i>Risk of bias</i></b>		
<b>Bias</b>	<b>Authors' judgement</b>	<b>Support for judgement</b>
Random sequence generation (selection bias)	Low risk	Cluster-randomisation. Schools were the unit of randomisation
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition analysis by adjusted logistic regression. Drop-outs were more likely to be older, non-white, users of alcohol, marijuana and tobacco. Differential attrition across condition was noted for race/ethnicity with those coded as "other" race being more likely to be in the control condition
Similarity of groups at baseline	Low risk	Quote: "at baseline demographic characteristics and substance use of treatment and control groups were comparable"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

**THINK SMART 2009**

Methods	Cluster (community) randomised
Participants	1216 students from 5th to 6th grade enrolled from the school systems of 14 frontier, isolated, rural communities in Alaska, during the 2006 to 2007 school years. 658 were eligible for the survey
Interventions	<p><b>Experimental:</b> the Think Smart curriculum is a modified form of the Personal Intervention Curriculum, which is based on an abstinence-based prevention model developed by Stephen Schinke for a Pacific Northwest American Indian population, that include sessions on stereotypes and drug facts and an introduction of a problem-solving model known as SODAS (Stop, Options, Decide, Act, Self-Talk), which emphasises refusal and self assertiveness skills. The stereotypes session addresses the concept of peer norms and cultural identify</p> <p>Social competence approach</p> <p>Deliverer: teacher</p> <p>n = not reported</p> <p>Interactive modality</p> <p>N of sessions: 12 sessions + 3 booster sessions during 5th to 6th grades</p> <p>Booster: yes, 3 sessions 2 to 3 months after the intervention</p> <p>Duration of the intervention: 6 months</p>

**THINK SMART 2009** (Continued)

**Control:** not reported, n = not reported

Outcomes	30-day use of tobacco, alcohol, marijuana, hashish and various legal substances  Knowledge of drug and consequences, assertiveness skills, cultural identity, peer use of harmful legal products, peer normative beliefs about HLPs
Notes	Outcome assessed at post-test (at the end of the intervention, in May 2007) and at 6 months after the end of the intervention (in 6th to 7th grades, in fall 2007)  Analysis sample not reported, n intervention group not reported, n control group not reported  Attrition: not reported  Data presented with beta and SE  No data suitable for inclusion in the meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Following the matching, a Microsoft Excel spreadsheet was generated using its automatic function "RAND" to finalize the assignment of the communities in the experimental and control conditions. One control group community dropped out of the study; therefore, we also dropped the matched intervention community, reducing the number of communities available for the outcome assessment to 14 communities."  "These analyses explore the possibility that the a priori pairwise random assignment of communities to intervention and comparison group may be systematically different on a larger set of community characteristics, as well as student characteristics."
Allocation concealment (selection bias)	Low risk	Quote: "Following the matching, a Microsoft Excel spreadsheet was generated using its automatic function "RAND" to finalize the assignment of the communities in the experimental and control conditions. One control group community dropped out of the study; therefore, we also dropped the matched intervention community, reducing the number of communities available for the outcome assessment to 14 communities."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "The one characteristic on which droppers and stayers differed is that Caucasians were more likely to leave the study at both post-test and follow-up. However, the magnitude of this difference was not impressive at post-test (d = 0.32) or follow-up (d = 0.24). As a result of these analyses, no further treatment is given to attrition. Missing covariate and mediator of substance-use data were imputed using the Expectation Maximization (EM) algorithm"
Similarity of groups at baseline	Unclear risk	Quote: "Although, in aggregate, the two groups are similar... there is considerable community diversity within each group (e.g., variation in community size, proportion of Alaska Natives, proximity to the larger communities that are the origin of supplies and services). This diversity is desirable, as it supports generalizations of study results to comparably diverse communities in Alaska and other frontier areas in the U.S. and worldwide."
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

## TND 1998

Methods	Cluster-RCT Selected schools were blocked by estimates of drug use prevalence, ethnic composition of the school and the community, student enrolment and standardised achievement test scores, and were randomly assigned by block to 1 of the 3 experimental conditions
Participants	1587 students from 21 continuation high schools (students who are unable to remain in the regular school system for functional reasons, including substance abuse when reaching high school age), California (USA). October 1994 through May 1995. Age 14 to 19 years
Interventions	<p><b>Experimental:</b> Project Towards No Drug abuse (TND) Health motivation, social skills, decision-making approach. The first 3 lessons motivated students to listen to pro health programming and provides them with effective listening skills. The second 3 lessons instructed students in chemical dependency issues and alternative coping skills, whilst the third 3 lessons encouraged the students to make non-drug-use choices 3 groups: - Classroom-only programme, n = 7 schools, n = not reported - Classroom plus a school as community programme (SAC), n = 7 schools Combined approach</p> <p>Deliverer: health educator</p> <p>Interactive modality</p> <p>N of sessions: 9 lessons in high schools</p> <p>Booster: no</p> <p>Duration of the intervention: 1 month</p> <p><b>Control group:</b> standard care: n = 7 schools; n = not reported</p>
Outcomes	<p>Marijuana use assessed by a questionnaire (past 30 days use)</p> <p>Hard drug use (past 30 days use)</p>
Notes	<p>Outcome assessed at post-test, 12 and 48 months follow-up after the end of programme</p> <p>Attrition at 1 year: 23%. Analysis sample n = 1074</p> <p>Data for inclusion in the tables were obtained from authors</p>

### Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "schools were blocked by estimates of drug use prevalence, ethnic composition of the school and the community, student enrolment and standardized achievement test scores, and were randomly assigned by block to one of the three experimental conditions."
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "there were no statistically significant differences of any assessed variables between subjects assessed only at pretest and those assessed at pretest and at post test"; not reported if % of attrition significantly differed between groups randomised to different interventions

**TND 1998** (Continued)

Similarity of groups at baseline	Low risk	Quote: "no statistical evidence that would indicate that the condition systematically varies in any of the pretest measures beyond random error was found, indicating successful randomisation"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Quote: "data collection was conducted by project staff who were not responsible for instruction of that particular set of students"

**TND 2001**

Methods	Cluster-RCT 3 general public high schools were randomly selected from general high schools; the classes were then randomly assigned to one of 2 experimental conditions. Classes are the unit of assignment and analysis At the analysis stage, a SAS Proc Mixed procedure was used in order to handle clustered data in the context of ANCOVA analysis	
Participants	1208 9th, 10th and 11th grade students in general high schools in Los Angeles (USA)	
Interventions	<p><b>Experimental:</b> Project Towards No Drug abuse (TND)  The classroom-based drug abuse prevention programme consisted of 3 50-minute sessions per week for 3 consecutive weeks during regularly scheduled class periods, with a health motivation, social skills, decision-making approach. The first 3 lessons motivated students to listen to pro health programming and provided them with effective listening skills. The second 3 lessons instructed students in chemical dependency issues and alternative coping skills, whilst the third 3 lessons encouraged the students to make non-drug-use choices  N: not reported</p> <p>Combined approach</p> <p>Deliverer: health educator</p> <p>Interactive modality</p> <p>N of sessions: 9 lessons in high schools</p> <p>Booster: no</p> <p>Duration of the intervention: 3 weeks</p> <p><b>Control group:</b> standard care condition, n = not reported</p>	
Outcomes	A school-wide pretest survey was conducted at each of the 26 classrooms immediately before the programme implementation and 1 year later  Marijuana use assessed by a questionnaire (past 30 days use)	
Notes	Outcome assessed at 12 months follow-up (after the end of the intervention)  Attrition at 1 year: 37.1%. Analysis sample n = 679 Data suitable for inclusion in the meta-analysis	

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Information not provided. Classrooms were the unit of allocation and analysis



**TND 2001** (Continued)

Allocation concealment (selection bias)	Unclear risk	Information not provided
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition analysis revealed no statistically significant difference for drug use at baseline and demographic characteristics between pretest sample and sample not lost at follow-up
Similarity of groups at baseline	Low risk	Quote: "no statistical evidence was found that would indicate that the condition groups systematically varied on any of the pretest measures indicating successful randomisation"
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Quote: "project staff previously unknown to the student assessed outcomes"; not clear if the project staff knew to which group the participant has been allocated

**TND 2002**

Methods	Cluster-RCT Selected schools were blocked by estimates of drug use prevalence, ethnic composition of the school and the community, student enrolment and standardised achievement test scores, and were randomly assigned by block to 1 of the 3 experimental conditions. Linear composite scores composed of these variables were created for each school; adjacent scores were used to form 6 triplets that then were randomly assigned to condition A generalised linear mixed model with a logit link function for dichotomous outcomes was applied to correct for cluster effect
Participants	1037 students from 18 continuation high school (students who are unable to remain in the regular school system for functional reasons, including substance abuse when reaching high school age), South California (USA). October 1997 through May 2000
Interventions	<b>Experimental:</b> Project Towards No Drug abuse (TND) The experimental curriculum consisted of 12 sessions of the 9-session programme already described in Sussman 1998. To the original programme 3 further sessions were added, focused on marijuana use prevention, tobacco use cessation and self control for drug abuse and violence prevention. A self instruction version of the curriculum was developed; during sessions, a health educator was available as a resource to students 2 groups: - Health educator led condition: n= not reported - Self instruction health educator assisted condition: n = not reported Combined approach  Deliverer: health educator  Interactive modality  N of sessions: 12 lessons in high schools  Booster: no  Duration of the intervention: 1 month  <b>Control group:</b> standard care, n = not reported
Outcomes	Marijuana use (past 30 days use); hard drug use (past 30 days use)  A school-wide pretest survey was conducted at each of the 18 schools immediately before the programme implementation and 1 year later 2-year follow-up surveys were administered only by telephone and by mail

**TND 2002** (Continued)

## Notes

Outcome assessed at 12 and 24 months follow-up

Attrition at 2 years: 44.6%. Analysis sample n = 575

Data for inclusion in the tables were obtained from authors

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Selected schools were blocked by estimates of drug use prevalence, ethnic composition of the school and the community, student enrolment and standardized achievement test scores, and were randomly assigned by block to one of the three experimental conditions. Linear composite scores composed of these variables were created for each school; adjacent scores were used to form six triplets that then were randomly assigned to condition."
Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "there were no statistically significant differences of any assessed variables between subjects assessed only at pretest and those assessed at pretest and at post test"; not reported if % of attrition significantly differed between groups randomised to different intervention
Similarity of groups at baseline	Unclear risk	Information not reported
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Quote: "data collection was conducted by project staff who were not responsible for instruction of that particular set of students"

**TND 2008**

Methods	Cluster-RCT  High schools in Southern California (n = 18) were randomly assigned to 1 of 3 conditions: cognitive perception information curriculum, cognitive perception information + behavioural skills curriculum or standard care (control)
Participants	A total of 3908 high school students were enrolled in the classrooms selected for participation in the study. Access was provided to 2734 of these students (70% of the enrolment roster), all of whom completed pretest questionnaires. Of these students who completed pretest questionnaires, 2064 (75.5% of those for whom had pretest survey) also completed the 1-year follow-up questionnaires. The sample of 2064 constitutes the analysis sample
Interventions	<b>Experimental:</b> Project Towards No Drug abuse (TND) The experimental curriculum consisted of 12 sessions of the 9-session programme already described in Sussman 1998. To the original programme 3 further sessions were added, focused on marijuana use prevention, tobacco use cessation and self control for drug abuse and violence prevention. A self-instruction version of the curriculum was developed; during sessions, a health educator was available as a resource to students 2 groups: - Arm A cognitive perception information: n = not reported, social influence approach - Arm B cognitive perception information + behavioural skills curriculum, n = not reported, combined approach

**TND 2008** (Continued)

Deliverer: health educator + teacher  
 Interactive modality  
 N of sessions: 12 lessons in high schools  
 Booster: no  
 Duration of the intervention: 1 month  
**Control group:** standard care: n = not reported

Outcomes	Marijuana use (past 30 days use); hard drug use (past 30 days use)
Notes	Duration of the intervention: Outcome assessed at 12 months follow-up, end of the intervention Attrition: 32.5% at 12 months Data reported as OR. No data suitable for meta-analysis

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Blocked randomisation
Allocation concealment (selection bias)	Unclear risk	Not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "Among the twelve comparisons, five statistically significant differences were detected. Compared to the lost-to-followup sample, the retained sample was slightly younger (15.7 versus 15.9 years of age), less likely to smoke cigarettes (21.9% versus 26.4%), less likely to be male (52.9% vs. 61.0%), less likely to be African American (7.2% vs. 10.4%) and more likely to be Latino (65.7% vs. 61.9%), and more likely to live with both parents (59.4% versus 49.3%). Although the retention rate was found to be significantly lower among CHS (64.6%) vs. RHS (80.4%) students, it did not differ across programme conditions (73.0% in Control, 73.5% in Cognitive Only, and 71.1% in Combined)." "To statistically adjust for possible bias induced by non-random attrition at one-year follow-up, a 'propensity to attrition' score was calculated for each subjects retained at the one-year follow-up, and adjusted for in the analysis. This score was calculated among the entire baseline sample by associating the difference in selected baseline measures to the actual attrition status in a multiple regression analysis, and then assuming the association is also maintained among the subjects retained at the one-year follow-up"
Similarity of groups at baseline	Low risk	The data show that cross-condition comparability was achieved for age, gender, programme provider, attrition rate and the 4 drug use outcomes
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Not specified

**UNPLUGGED 2008**

Methods	Cluster-RCT
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**UNPLUGGED 2008** (Continued)

At the analysis stage a multilevel modelling approach was used in order to take into account the hierarchical structure of the data and the cluster effect

Participants	7079 junior high school students from 170 schools (12 to 14 years old) in Austria, Belgium, Germany, Greece, Italy, Spain and Sweden. Pretest data collected during September to October 2004. 2 schools dropped out after baseline survey, 1 from the control arm and 1 from the intervention arm. Post-test survey completed with 6604 students
Interventions	<p><b>Experimental:</b> Project UNPLUGGED. Comprehensive social influence approach incorporating components of critical thinking, decision-making, problem-solving, creative thinking, effective communication, interpersonal relationship skills, self awareness, empathy, coping with emotions and stress, normative belief, knowledge about the harmful effect of drugs</p> <p>Group 1. Basic arm, n = 1190</p> <p>Group 2. Parent arm: parents invited to participate in 3 workshops, n = 1164</p> <p>Group 3. Peer arm: 2 students per class had the task to conduct short meetings with their classmates, n = 1193</p> <p>Combined (social influence + social competence) approach</p> <p>Deliverer: teacher + peer</p> <p>Interactive modality</p> <p>N of sessions: 12</p> <p>Booster: no</p> <p>Duration of the intervention: 3 months</p> <p><b>Control group:</b> no intervention, n = 3532</p>
Outcomes	Use of any drugs and cannabis measured as any use in the past 30 days. Changes in knowledge, intention to use
Notes	<p>Outcome assessed at 3 months and 12 months after the end of the intervention</p> <p>Attrition at post-test: 3.5%; at 12 months follow-up: 28.2%</p>

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Cluster-randomised trial. The randomisation was stratified by socio-economic level
Allocation concealment (selection bias)	Low risk	Central randomisation
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "to assess the possible attrition bias we analysed the program effect after carrying forward the outcome status last assessed. Also, we repeated the analysis according to the best case-worst case scenario. In the first case all non participating were considered non users, in the second case they were considered users"
Similarity of groups at baseline	Low risk	Quote: "significant differences in the prevalence of some substance use between intervention and control group were detected. It appeared to be due to the inclusion among control schools to one school with an unusually high

**UNPLUGGED 2008** (Continued)

prevalence of substance use. After excluding this school the baseline prevalence was very similar across groups"

Blinding of outcome assessment (detection bias) subjective outcomes	Low risk	Self completed anonymous questionnaire
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**UNPLUGGED 2012**

Methods	Cluster-RCT
Participants	1874 participants 6th grade, 74 schools Czech Republic
Interventions	<b>Experimental intervention:</b> Unplugged focuses on knowledge and attitudes (4 units), interpersonal skills (4 units) and intrapersonal skills (4 units), n = 1022  Combined (competence + influence) approach  Deliverer: teacher  Interactive  Number of sessions: 12  Booster: no  Duration of intervention: 1 school year (10 months) <b>Control group:</b> no intervention, n = 852
Outcomes	Self reported use of legal substances and cannabis in the past 30 days, self reported lifetime illegal drug use (ever used any of marijuana, heroin, amphetamine, ecstasy, LSD or hallucinogens, GHB or tranquillisers without a medical prescription)
Notes	Outcome assessed at post-test, 3, 12, 15, 24 months  Attrition at:  Post-test: experimental 12%, control 9.27%  3 months: experimental 6.46%, control 0%  12 months: experimental 5.77%, control 0%  15 months: experimental 7.2%, control 0.7%  Final wave (24 months): experimental: 10.57%, control: 1.5%  Data for inclusion in meta-analysis provided by authors

**Risk of bias**

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Information not reported

**UNPLUGGED 2012** (Continued)

Allocation concealment (selection bias)	Unclear risk	Information not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Higher attrition in the experimental group and unbalanced
Similarity of groups at baseline	Low risk	No statistically significant differences in demographic characteristics (sex, age, family income level) between the experimental and the control groups at baseline period. At baseline, the experimental group showed no statistically significant differences in substance use as compared to the control group, after the correction for number of tests
Blinding of outcome assessment (detection bias) subjective outcomes	Unclear risk	Information not reported

ADM: Adolescent Decision-Making programme  
 ASAP: Alcohol and Substance Abuse Prevention programme  
 ATD: Alcohol/Tobacco/Drug use/abuse programme  
 CHARLIE: Chemical Abuse Resolution Lies in Education project  
 CNS: central nervous system  
 DARE: Drug Abuse Resistance Education project  
 GBG: Good Behavior Game project  
 GHB: gamma-hydroxybutyric acid  
 KACM: Keep A Clear Mind project  
 kiR: 'keepin' it REAL' project  
 LST: Life Skills Training  
 OR: odds ratio  
 RCT: randomised controlled trial  
 SE: standard error  
 SES: socioeconomic status  
 SMART: Self Management and Resistance Training project  
 TCYL: Take Charge of Your Life project  
 TND: Towards No Drug (abuse) project

**Characteristics of excluded studies** [ordered by study ID]

Study	Reason for exclusion
<a href="#">Ambtman 1990</a>	RCT. Randomisation failed: selection of schools to be enrolled occurred after the assignment of the intervention. No attempt to control for confounding variables at the analysis stage
<a href="#">Amirian 2012</a>	No random allocation
<a href="#">Amundsen 2010</a>	Controlled, non-randomised, prospective study
<a href="#">Battistich 1996</a>	Not exclusively school-based
<a href="#">Becker 1992</a>	DARE project Controlled, non-randomised, prospective study
<a href="#">Bernett 2012</a>	Schools selected on the basis of drug use risk

Study	Reason for exclusion
Blum 1978	Excluded because primary outcome is transition from pattern drug use to another, and not incidence of use. Moreover, it seems that randomisation is subject and not class-based, with a high suspicion of contamination. Finally, high attrition (25%) suggests a high risk of bias
Bonaguro 1988	Controlled, non-randomised, prospective study
Botvin 1997	Controlled, non-randomised, prospective study
Botvin 2000	RCT. Follow-up analysis of a sub-sample of the original study ( LST 1990, Botvin 1995, included): only 447 students out of 3597 participating in the original study completed the drug use questionnaire
Bry 1982	RCT. Unclear attrition rate. No useful measures investigating drug use. Some evidence of failure of the randomisation procedure
Calafat 1984	RCT Unclear unit of randomisation, methods and base population. Unclear individual linkage between assessment and exposure
Calafat 1989	Effects of illegal drugs not measured because of the low percentage of users at this age
Calafat 1995	Effects of illegal drugs not measured because of the low percentage of users at this age
Clark 2011a	Selective prevention programme
Clark 2011b	Longitudinal follow-up of a RCT population
Colnes 2001	Outcome not assessed in the target population
Connell 1986	Substance use not assessed
Conrod 2012	Selective programme
Cuijpers 2002	Controlled, non-randomised, prospective study
D'Amico 2002	Participants are already users
De Jong 1987	Controlled, non-randomised, prospective study
De La Rosa 1995	RCT. The units of randomisation were too limited to assure the validity of the method. No confounding adjustment at the analysis stage. No data are presented for drug use or mediating variables
Dedobbeleer 2001	Controlled, non-randomised, prospective study
Dent 1998	Unclear randomisation procedure. Process evaluation; high attrition rates (54%). No measure useful for the review
DeWit 2000	Controlled, non-randomised, prospective study
Donaldson 1994	RCT. Unclear methods of analysis; initial random assignment to the groups was not taken into account at the analysis stage
Dukes 1997	Controlled, non-randomised, prospective study



Study	Reason for exclusion
Duncan 2000	RCT. No criteria for selecting students were presented. Intervention consisted of the broadcast of an interactive CD during a morning session. Post-test was carried out the day after the intervention
Dupont 1984	Substance use not assessed
Eggert 1990	Controlled, non-randomised, prospective study
Eggert 1994	RCT. Analysis of 3 cohorts (1989, 1990, 1991 school years); the programme offered was different for the third cohort. The experimental conditions were merged at the analysis stage. Some evidence of failed randomisation. The second paper (Thompson 1997) compared late versus early cohort effects
Elliot 2012	No behavioural outcomes
Errecart 1991	Controlled, non-randomised, prospective study
Fraguela 2002	Life Skills Training programme modified Controlled, non-randomised, prospective study
Freimuth 1997	SMART Project Controlled, non-randomised, prospective study
Ghosh-Dastidar 2004	Substance use not assessed
Gilchrist 1987	The programme targeted a particular population
Giles 2010	Focused on coaching as a means to improve the quality with which teachers implemented All Star curriculum
Gonzalez 1990	Substance use not assessed
Graham 1990	SMART 1990 Project RCT. Analysis of 3 cohorts (1982, 1983, 1984 school years); the programmes offered were different for the 3 cohorts. The experimental conditions were merged at the analysis stage. 3-year evaluation of the original study (Hansen 1988, included)
Green 1989	Controlled, non-randomised, prospective study
Griffin 2003	RCT. Secondary analysis of a sub-sample of the original study (LST 001, Botvin 2001, included), based on risk level
Haaga 2011	Indicated prevention programme
Hansen 1997	Controlled, non-randomised, prospective study
Hansen 2004	Pilot study for the All Stars Plus programme. Controlled, non-randomised, prospective study
Hansen 2011	No focused on drug use
Harmon 1993	Controlled, non-randomised, prospective study
Harrington 2001	Observational study
Huang 2012	No behavioural outcomes
Kim 1981	Controlled, non-randomised, prospective study

Study	Reason for exclusion
<a href="#">Kim 1982</a>	Controlled, non-randomised, prospective study
<a href="#">Kim 1989</a>	Outcome measures did not meet the inclusion criteria
<a href="#">Kim 1993</a>	RCT. Unclear methods; some evidence of randomisation failure. High attrition rates (51%)
<a href="#">Komro 2013</a>	Selected population
<a href="#">Kovach Clark 2010</a>	Not substance use assessed
<a href="#">Kreutter 1991</a>	Controlled, non-randomised, prospective study
<a href="#">Lewis 1972</a>	Controlled, non-randomised, prospective study
<a href="#">Lisha 2012</a>	Schools selected on the basis of drug use risk
<a href="#">Longshore 2007</a>	Participants did not meet the inclusion criteria: high-risk population
<a href="#">LoSciuto 1988</a>	PRIDE Project RCT. Randomisation failed. No control of confounding variables at the analysis stage
<a href="#">McAlister 1980</a>	Controlled, non-randomised, prospective study
<a href="#">Menrath 2012</a>	No focused on drug use
<a href="#">Moberg 1990</a>	Controlled, non-randomised, prospective study
<a href="#">Moon Hopson 2006</a>	Controlled, non-randomised, prospective study
<a href="#">Moskowitz 1983</a>	Controlled, non-randomised, prospective study
<a href="#">Nasir 2011</a>	No behavioural outcomes
<a href="#">Nozu 2006</a>	Controlled, non-randomised, prospective study
<a href="#">O'Donnell 1995</a>	Quasi-experimental study. The randomisation procedure was applied only to a sub-sample of the study population. Inadequate control for confounding variables at the analysis stage
<a href="#">O'Leary-Barrett 2011a</a>	Not focused on substance use
<a href="#">O'Leary-Barrett 2011b</a>	Selective prevention programme
<a href="#">O'Neill 2011</a>	Longitudinal follow-up of a RCT population
<a href="#">Olton 1985</a>	RCT. No results were presented for control group
<a href="#">Pentz 1989</a>	Midwestern Prevention Project Controlled, non-randomised, prospective study
<a href="#">Petoskey 1998</a>	Controlled, non-randomised, prospective study
<a href="#">Prinz 2000</a>	EARLY ALLIANCE Prevention Trial Controlled, non-randomised, prospective study
<a href="#">Raghupathy 2012</a>	Selected population

Study	Reason for exclusion
<a href="#">Raynal 1996</a>	Controlled, non-randomised, prospective study
<a href="#">Reynolds 1995</a>	Selective prevention programme
<a href="#">Ringwalt 2009</a>	Focused on coaching as a means to improve the quality with which teachers implemented All Star curriculum
<a href="#">Ringwalt 2011</a>	Not focused on substance use
<a href="#">Rollin 1994</a>	KICK Project RCT. Unclear randomisation procedure; some evidence of failure in randomisation. Inadequate control for confounding factors at the analysis stage
<a href="#">Rosenbaum 1994</a>	Controlled, non-randomised, prospective study
<a href="#">Ross 1998</a>	Controlled, non-randomised, prospective study
<a href="#">Sarvela 1987</a>	Controlled, non-randomised, prospective study
<a href="#">Schaps 1982</a>	Type of outcomes assessed
<a href="#">Schinke 1988</a>	The programme targeted a particular population
<a href="#">Schinke 2000</a>	RCT. Students enrolled in the study were Native Americans from reservations in USA; the programme was focused on Native American culture, values and traditions
<a href="#">Shetgiri 2011</a>	Selective prevention programme
<a href="#">Shope 1996</a>	RCT. Randomisation failed. No control for confounding variables at the analysis stage. Unclear attrition rates
<a href="#">Short 1998</a>	Participants assigned to intervention and control group are subsamples of different population groups
<a href="#">Skroban 1999</a>	Controlled, non-randomised, prospective study
<a href="#">Snow 1997</a>	RCT. Secondary analysis of a sub-sample of the original study (ADM 1992, Gersick 1988, included), based on students' family household status
<a href="#">Spoth 2013</a>	Prescription drugs
<a href="#">Stevens 1996</a>	Controlled, non-randomised, prospective study
<a href="#">Stormshak 2011</a>	Family intervention carried out in the school
<a href="#">Sussman 2012</a>	Schools selected on the basis of high drug use risk of students
<a href="#">Tatchell 2001</a>	Substance use not assessed
<a href="#">Teesson 2013</a>	Selective prevention programme
<a href="#">Tibbits 2011</a>	Controlled, non-randomised, prospective study. No random allocation
<a href="#">Valentine 1998</a>	Controlled, non-randomised, prospective study
<a href="#">Valentine 1998a</a>	Urban Youth Connection

Study	Reason for exclusion
	Controlled, non-randomised, prospective study
<a href="#">Villalbì 1993</a>	RCT. Randomisation failed. No control for confounding variables at the analysis stage
<a href="#">Weiss 1998</a>	Selective prevention programme
<a href="#">West 2008</a>	Intervention focused only on prevention of alcohol abuse
<a href="#">Wherch 2005 b</a>	Intervention not realised in a school setting
<a href="#">Young 1997</a>	Controlled, non-randomised, prospective study

DARE: Drug Abuse Resistance Education project

RCT: randomised controlled trial

### Characteristics of studies awaiting assessment *[ordered by study ID]*

#### [Gubanich 2011](#)

Methods	Prospective RCT
Participants	Approximately 500 4th to 5th grade students (5 schools, 27 classrooms) from inner city Cleveland
Interventions	Healthy Futures Initiative: 10-week curriculum
Outcomes	Knowledge, behaviour, minutes of physical activity, BMI measurement, substance use
Notes	—

#### [Poduska 2009](#)

Methods	RCT
Participants	1st to 3rd grade students from 12 schools
Interventions	Whole Day First Grade Program (WD) had a multilevel structure and aimed at 2 early antecedents drug abuse and other problem behaviours (aggressive, disruptive behaviour and poor academic achievement)
Outcomes	Skills and aggressive behaviour, children's learning
Notes	—

#### [Seal 2006](#)

Methods	Randomised pretest and post-test comparative design
Participants	107 Thai high school students from 7th to 12th grade
Interventions	Life skills training programme (LST) provided information and skills specifically related to drug and tobacco use. 10 class periods

## Seal 2006 (Continued)

Outcomes	Knowledge level; attitude toward tobacco and drug use prevention; refusal, decision-making and problem-solving skills; frequency
Notes	—

BMI: body mass index

RCT: randomised controlled trial

## Characteristics of ongoing studies [ordered by study ID]

### Bannink 2012

Trial name or title	E-health4Uth
Methods	E-health4Uth and E-health4Uth combined with personal counselling (E-health4Uth+counselling). 3-armed cluster-RCT
Participants	4th grade students from the Netherlands
Interventions	E-health4Uth involves internet-based, tailored health messages focused on 9 topics related to health behaviour and well-being. Students in the E-health4Uth + counselling group are also invited for an appointment to see the nurse when they are at risk of mental health problems
Outcomes	Primary: health behaviour (alcohol, drugs, smoking, safe sex) and mental status Secondary: health-related quality of life
Starting date	Not reported
Contact information	—
Notes	—

### Hodder 2012

Trial name or title	Not reported
Methods	Cluster-RCT
Participants	7th to 10th grade students from 32 schools in disadvantaged areas
Interventions	Comprehensive resilience intervention
Outcomes	Primary: tobacco, alcohol, marijuana and other illicit drug use
Starting date	Not reported
Contact information	—
Notes	—

### Midford 2012

Trial name or title	Drug education in Victorian schools (DEVS)
Methods	Cluster-RCT
Participants	1746 junior high school students (aged 13 to 15 years) in 21 Victorian secondary schools over a period of 3 years
Interventions	Comprehensive, evidence-based, harm reduction-focused school drug education programme. Comprises 10 lessons in year 8 (13 to 14-year olds) and 8 in year 9 (14 to 15-year olds) that address issues around the use of alcohol, tobacco, cannabis and other illicit drugs
Outcomes	Knowledge, patterns and context of use, attitudes and harms experienced in relation to alcohol, tobacco, cannabis and other illicit drug use
Starting date	Not reported
Contact information	—
Notes	—

### Newton 2012a

Trial name or title	CAP (Climate and Preventure) intervention
Methods	Cluster-RCT
Participants	24 Australian schools
Interventions	CAP (Climate and Preventure) intervention combines the 'universal' Climate and 'indicated' Preventure programmes. A comprehensive approach to substance use
Outcomes	Drug knowledge, drug use, related harms and mental health symptoms
Starting date	Not reported
Contact information	—
Notes	—

### Newton 2012b

Trial name or title	CAP (Climate and Preventure) intervention
Methods	Cluster-RCT
Participants	Students aged 13 to 14 years old from 27 secondary schools in New South Wales and Victoria, Australia
Interventions	The CAP study is an integrated approach to alcohol misuse prevention, which combines the effective universal internet-based Climate Schools programme with the effective selective personality-targeted Preventure programme

## Newton 2012b (Continued)

Outcomes	Primary: the uptake and harmful use of alcohol and alcohol-related harms. Secondary: alcohol and cannabis-related knowledge, cannabis-related harms, intentions to use and symptoms of mental health
Starting date	Not reported
Contact information	—
Notes	—

RCT: randomised controlled trial

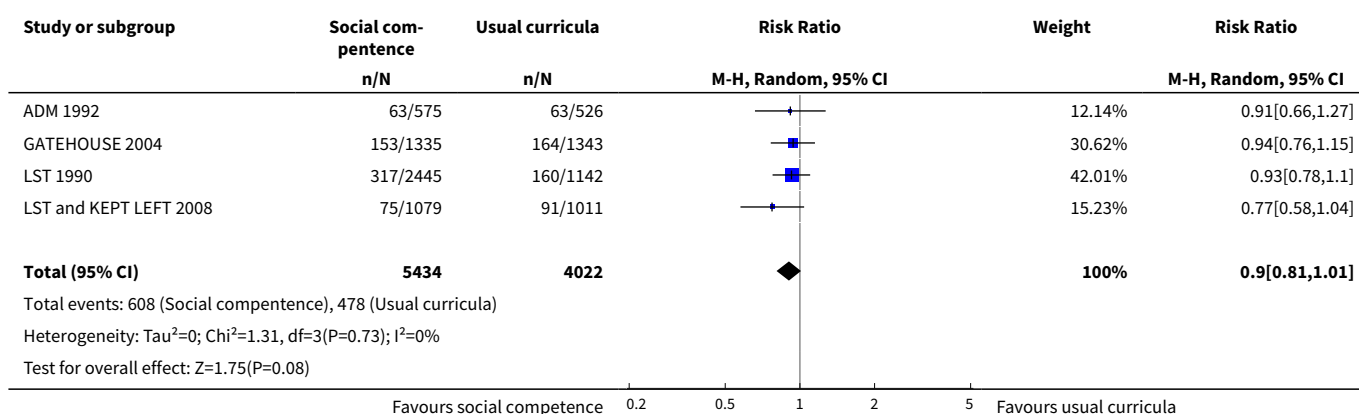
## DATA AND ANALYSES

### Comparison 1. Social competence versus usual curricula

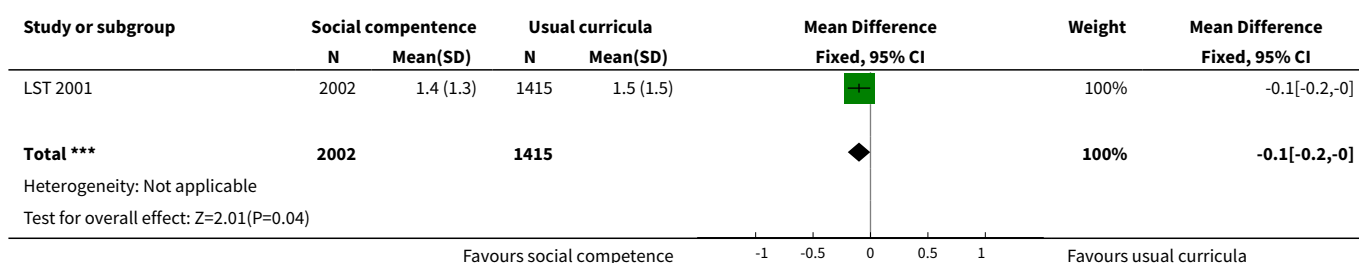
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Marijuana use < 12 months	4	9456	Risk Ratio (M-H, Random, 95% CI)	0.90 [0.81, 1.01]
2 Marijuana use < 12 months	1	3417	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.20, -0.00]
3 Marijuana use ≥ 12 months	1	2678	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.74, 1.00]
4 Marijuana use ≥ 12 months	1	1075	Mean Difference (IV, Fixed, 95% CI)	-0.02 [-0.10, 0.06]
5 Hard drug use < 12 months	1	2090	Risk Ratio (M-H, Fixed, 95% CI)	0.69 [0.40, 1.18]
6 Hard drugs use ≥ 12 months	1	1075	Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.06, 0.04]
7 Other drug use < 12 months	1	1270	Risk Ratio (M-H, Fixed, 95% CI)	0.72 [0.53, 0.98]
8 Other drugs use < 12 months	1	3434	Mean Difference (IV, Fixed, 95% CI)	-0.05 [-0.11, 0.01]
9 Any drug use < 12 months	2	2512	Risk Ratio (M-H, Random, 95% CI)	0.27 [0.14, 0.51]
10 Any drug use < 12 months	1	1566	Mean Difference (IV, Fixed, 95% CI)	0.02 [-0.05, 0.09]
11 Drug knowledge < 12 months	4	3593	Std. Mean Difference (IV, Random, 95% CI)	1.02 [0.11, 1.93]
11.1 Rehearsal plus	2	91	Std. Mean Difference (IV, Random, 95% CI)	1.72 [1.19, 2.24]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
11.2 Other programs	2	3502	Std. Mean Difference (IV, Random, 95% CI)	0.34 [-0.43, 1.11]
12 Intention to use marijuana < 12 months	1	3417	Mean Difference (IV, Fixed, 95% CI)	-0.12 [-0.19, -0.05]
13 Intention to use hard drugs < 12 months	1	3417	Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.04, 0.02]
14 Intention to use other drugs < 12 months	1	3417	Mean Difference (IV, Fixed, 95% CI)	-0.04 [-0.07, -0.01]
15 Intention to use any drug < 12 months	1	120	Risk Ratio (M-H, Fixed, 95% CI)	0.21 [0.02, 1.84]
16 Intention to use any drug < 12 months	1	1566	Mean Difference (IV, Fixed, 95% CI)	0.04 [-0.07, 0.15]

### Analysis 1.1. Comparison 1 Social competence versus usual curricula, Outcome 1 Marijuana use < 12 months.

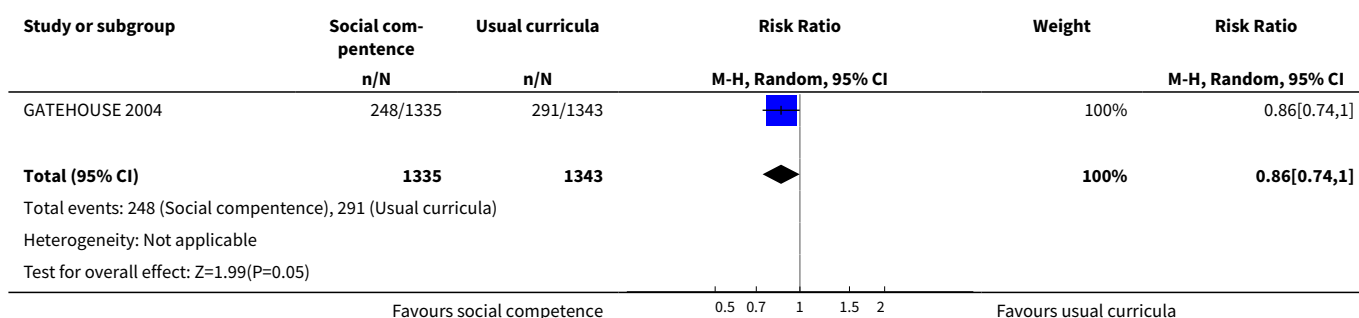


### Analysis 1.2. Comparison 1 Social competence versus usual curricula, Outcome 2 Marijuana use < 12 months.

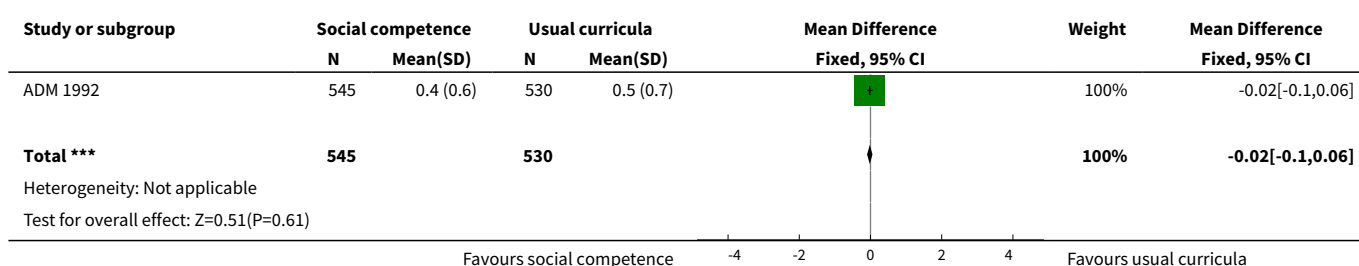




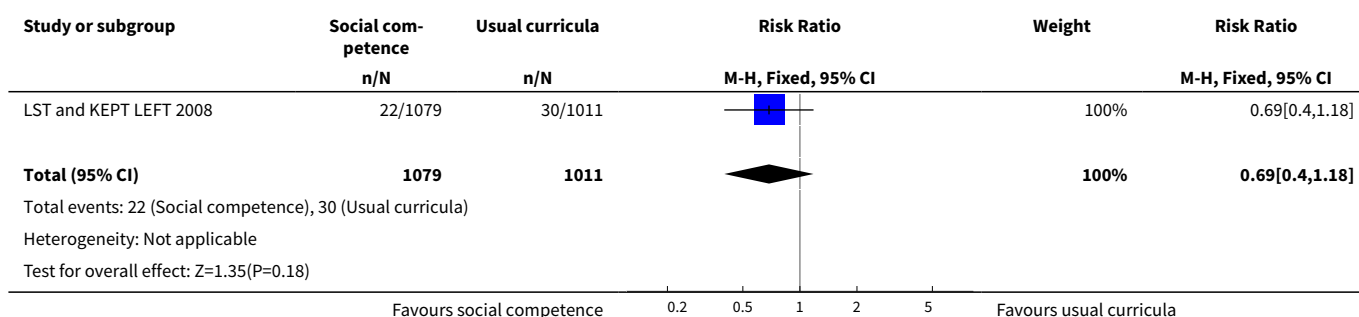
### Analysis 1.3. Comparison 1 Social competence versus usual curricula, Outcome 3 Marijuana use $\geq 12$ months.



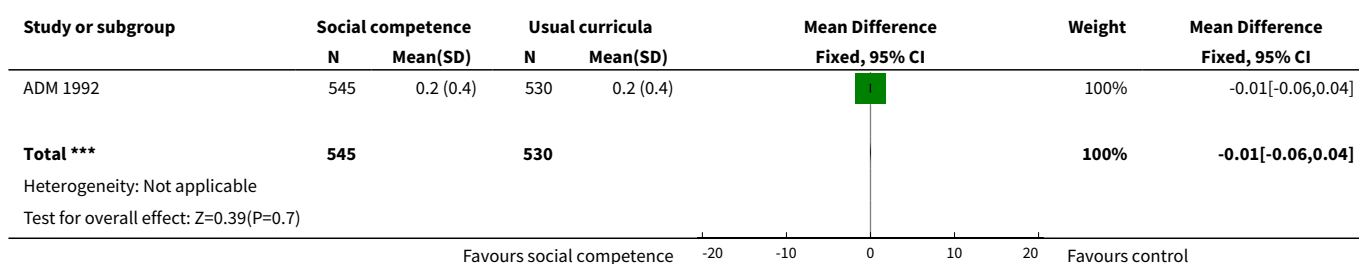
### Analysis 1.4. Comparison 1 Social competence versus usual curricula, Outcome 4 Marijuana use $\geq 12$ months.



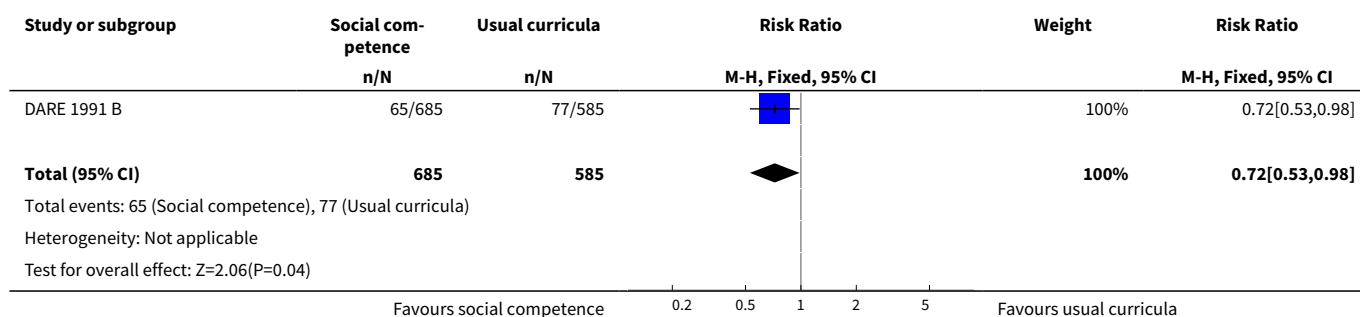
### Analysis 1.5. Comparison 1 Social competence versus usual curricula, Outcome 5 Hard drug use $< 12$ months.



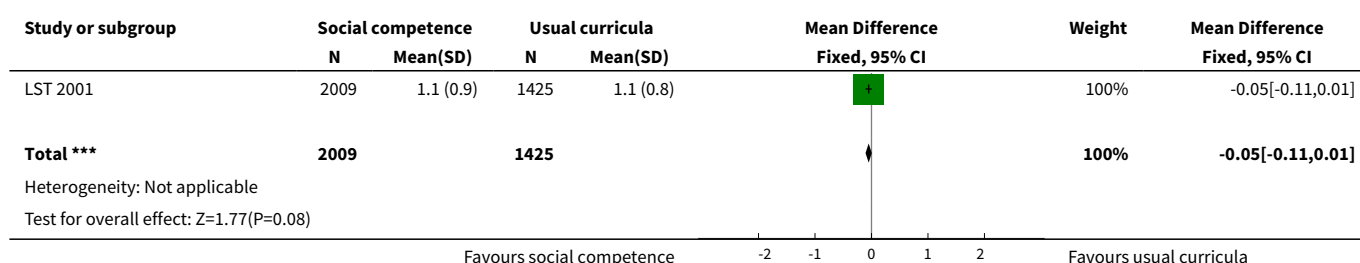
### Analysis 1.6. Comparison 1 Social competence versus usual curricula, Outcome 6 Hard drugs use $\geq 12$ months.



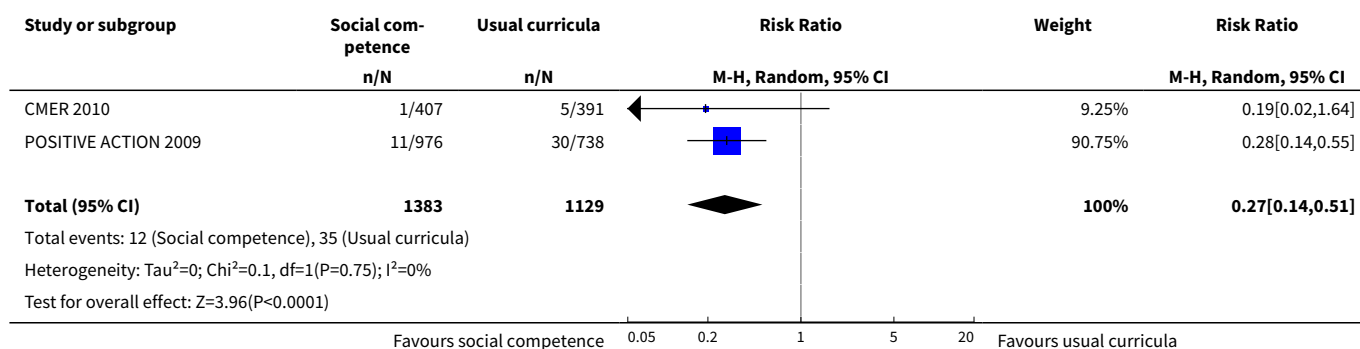
### Analysis 1.7. Comparison 1 Social competence versus usual curricula, Outcome 7 Other drug use < 12 months.



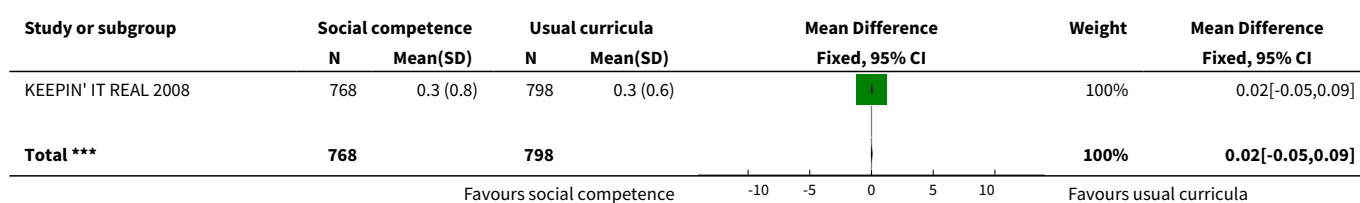
### Analysis 1.8. Comparison 1 Social competence versus usual curricula, Outcome 8 Other drugs use < 12 months.

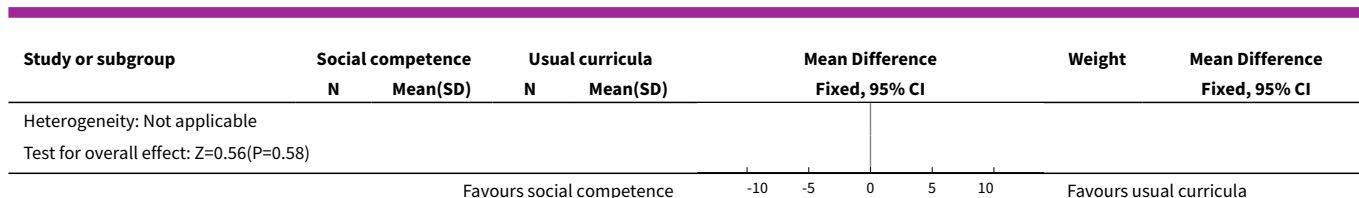


### Analysis 1.9. Comparison 1 Social competence versus usual curricula, Outcome 9 Any drug use < 12 months.

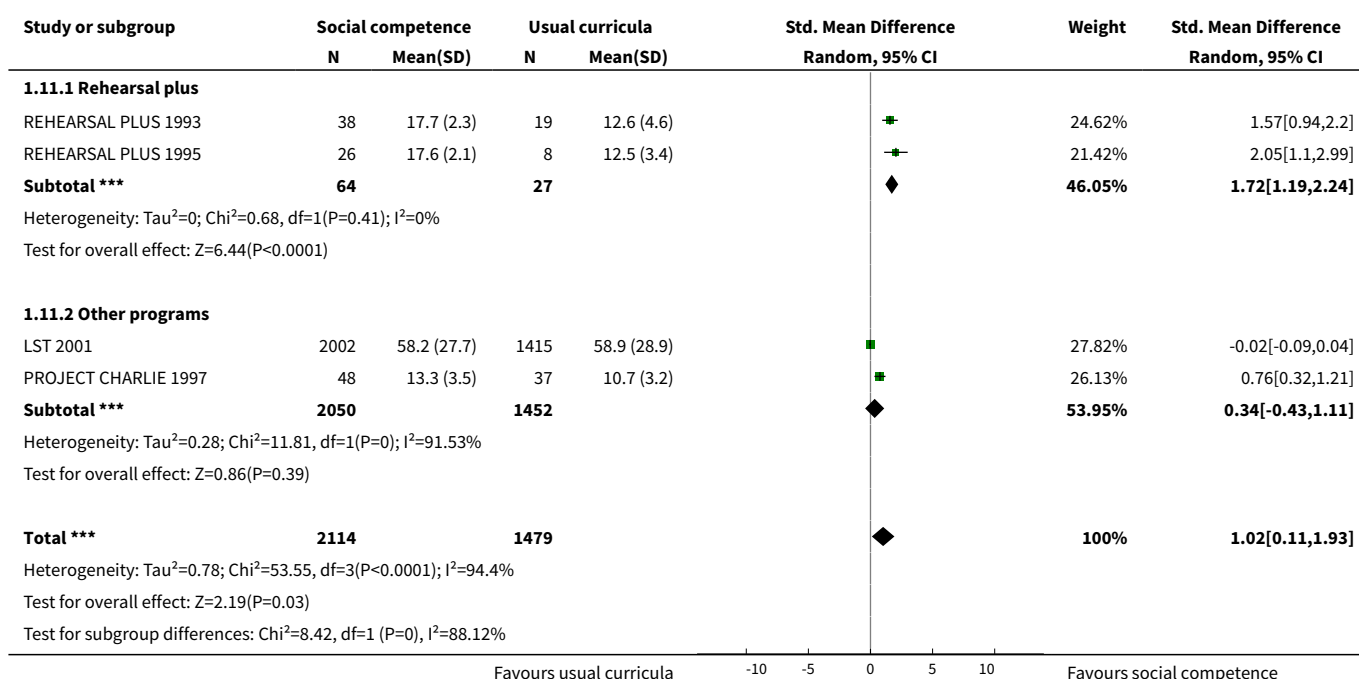


### Analysis 1.10. Comparison 1 Social competence versus usual curricula, Outcome 10 Any drug use < 12 months.

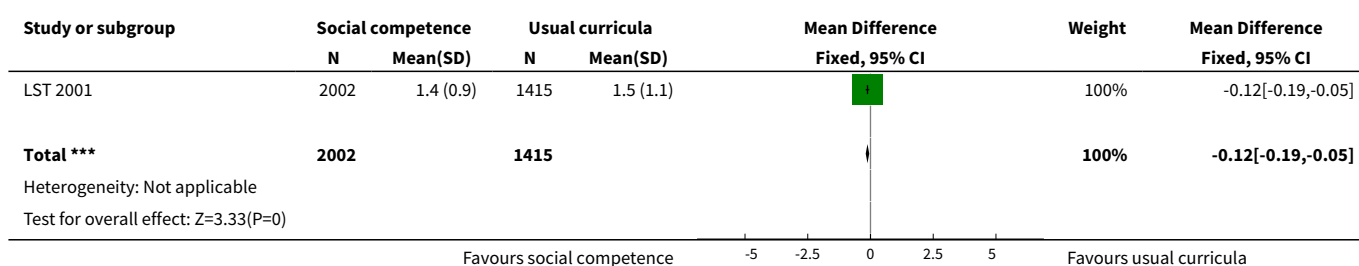




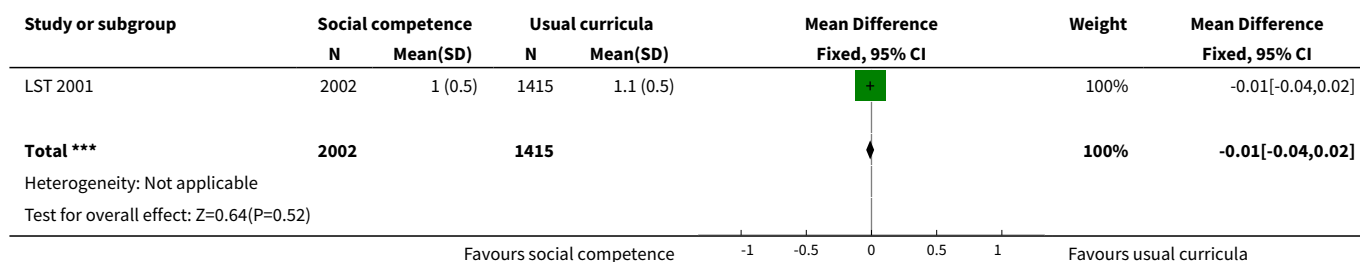
### Analysis 1.11. Comparison 1 Social competence versus usual curricula, Outcome 11 Drug knowledge < 12 months.



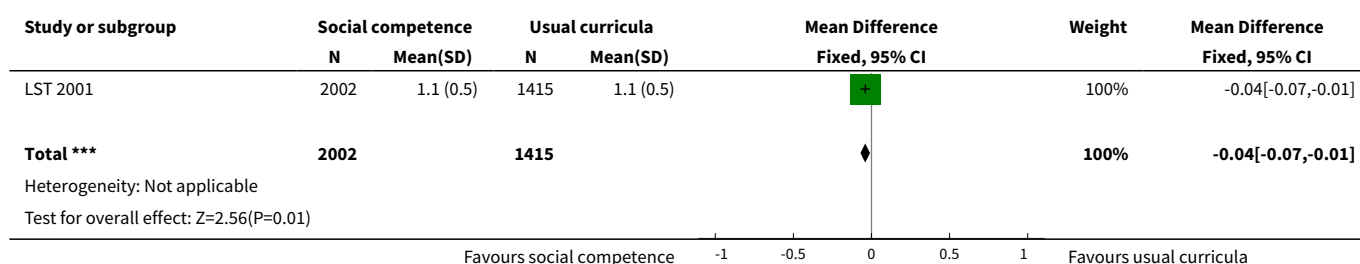
### Analysis 1.12. Comparison 1 Social competence versus usual curricula, Outcome 12 Intention to use marijuana < 12 months.



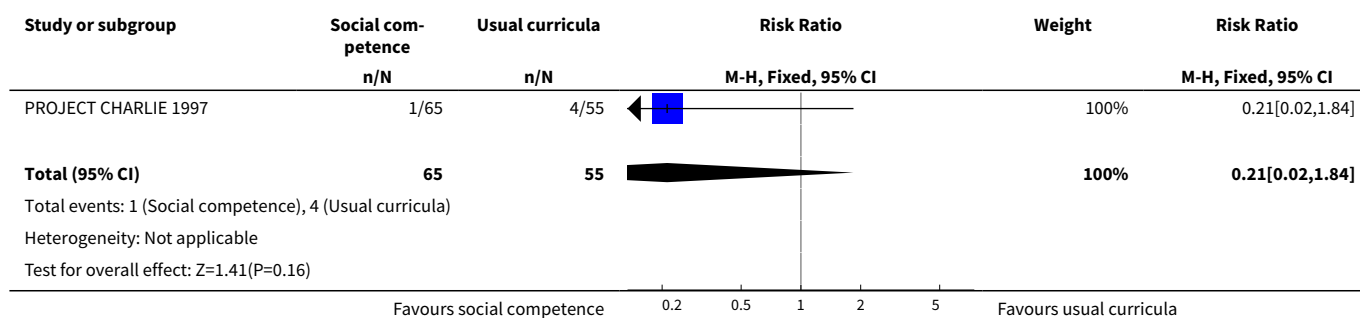
### Analysis 1.13. Comparison 1 Social competence versus usual curricula, Outcome 13 Intention to use hard drugs < 12 months.



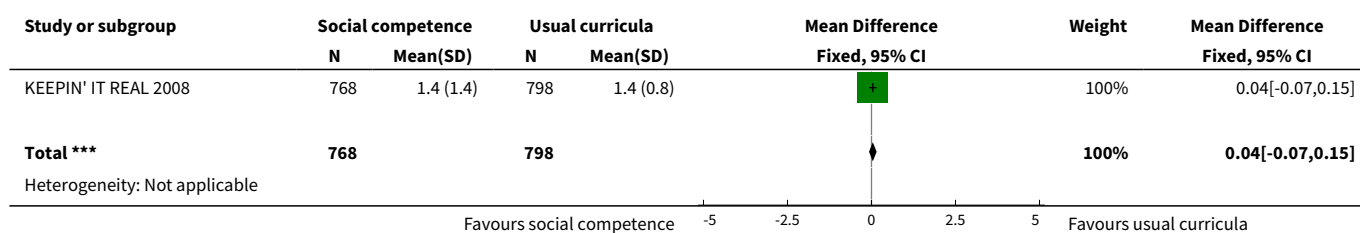
### Analysis 1.14. Comparison 1 Social competence versus usual curricula, Outcome 14 Intention to use other drugs < 12 months.

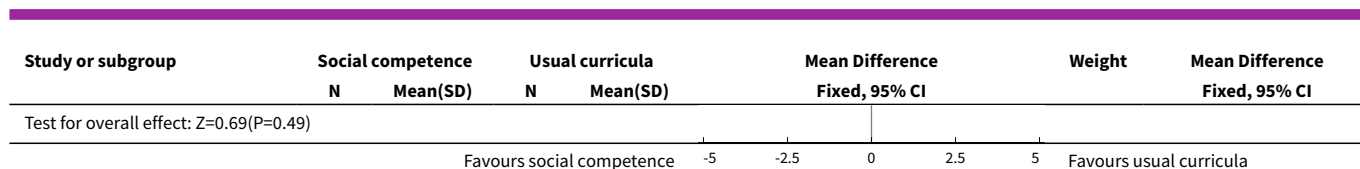


### Analysis 1.15. Comparison 1 Social competence versus usual curricula, Outcome 15 Intention to use any drug < 12 months.



### Analysis 1.16. Comparison 1 Social competence versus usual curricula, Outcome 16 Intention to use any drug < 12 months.

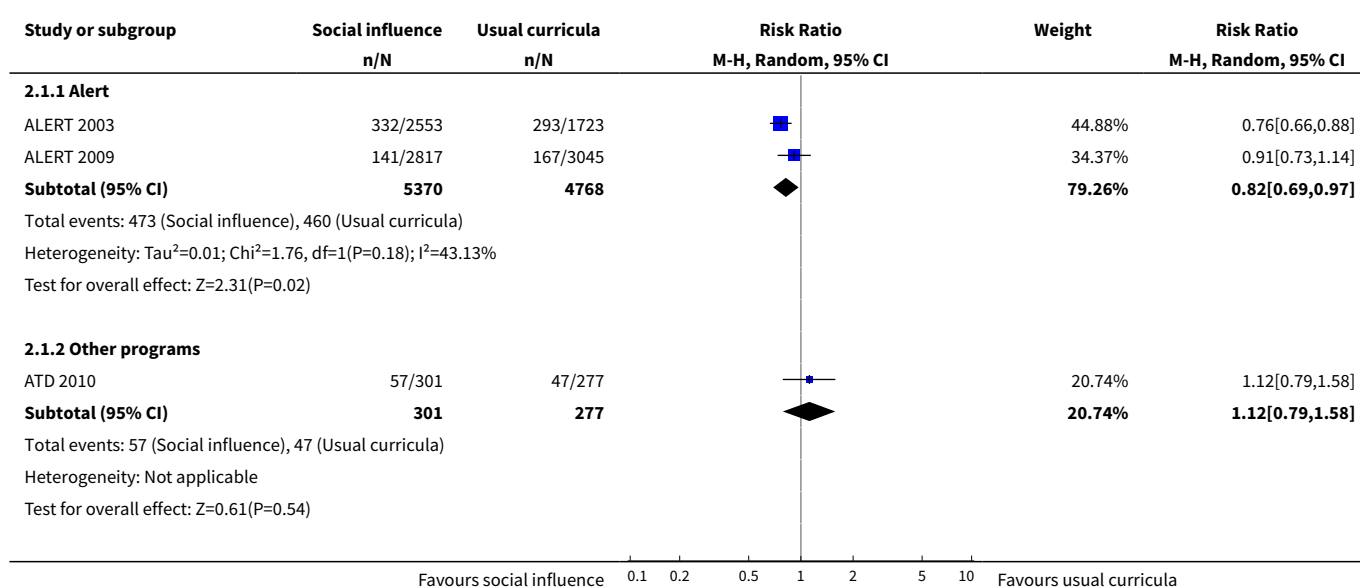


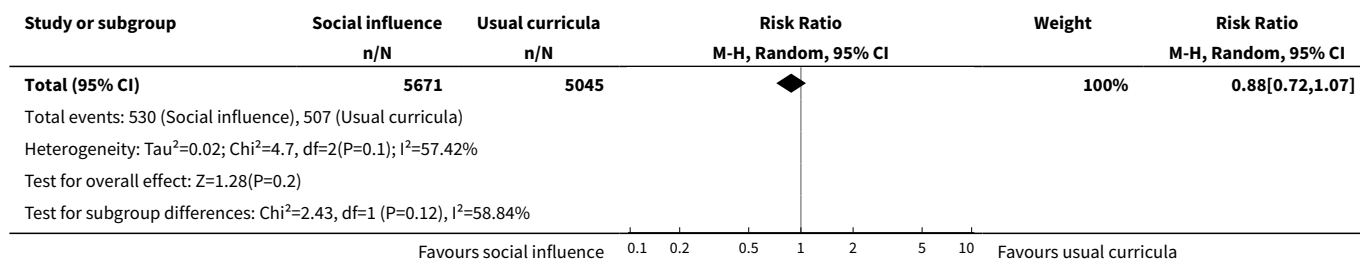


## Comparison 2. Social influence versus usual curricula

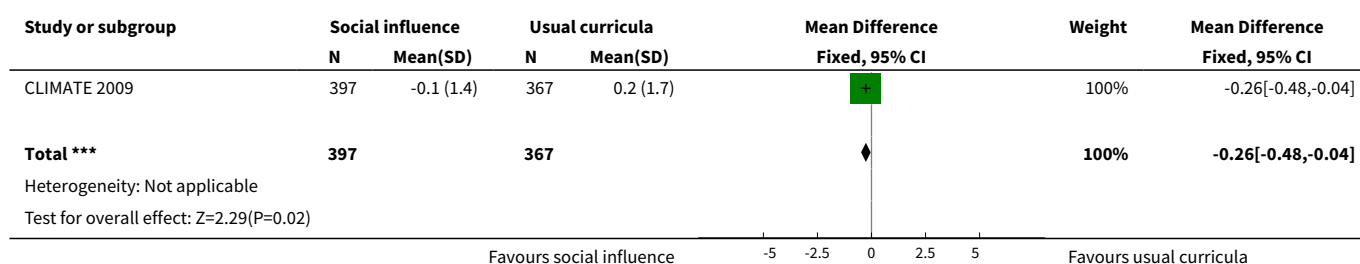
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Marijuana use < 12 months	3	10716	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.72, 1.07]
1.1 Alert	2	10138	Risk Ratio (M-H, Random, 95% CI)	0.82 [0.69, 0.97]
1.2 Other programs	1	578	Risk Ratio (M-H, Random, 95% CI)	1.12 [0.79, 1.58]
2 Marijuana use < 12 months	1	764	Mean Difference (IV, Fixed, 95% CI)	-0.26 [-0.48, -0.04]
3 Marijuana use ≥ 12 months	1	5862	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.81, 1.13]
4 Marijuana use ≥ 12 months	1	764	Mean Difference (IV, Fixed, 95% CI)	-0.22 [-0.46, 0.02]
5 Other drug use < 12 months	1	5862	Risk Ratio (M-H, Fixed, 95% CI)	1.08 [0.93, 1.27]
6 Other drugs use ≥ 12 months	1	5862	Risk Ratio (M-H, Fixed, 95% CI)	1.33 [1.13, 1.57]
7 Drug knowledge < 12 months	1	764	Mean Difference (IV, Fixed, 95% CI)	1.5 [0.58, 2.42]
8 Drug knowledge ≥ 12 months	1	764	Mean Difference (IV, Fixed, 95% CI)	1.65 [0.69, 2.61]

### Analysis 2.1. Comparison 2 Social influence versus usual curricula, Outcome 1 Marijuana use < 12 months.

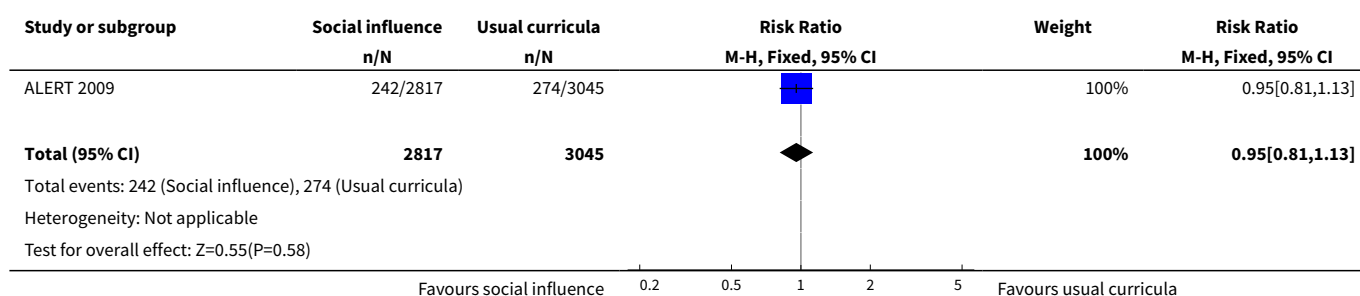




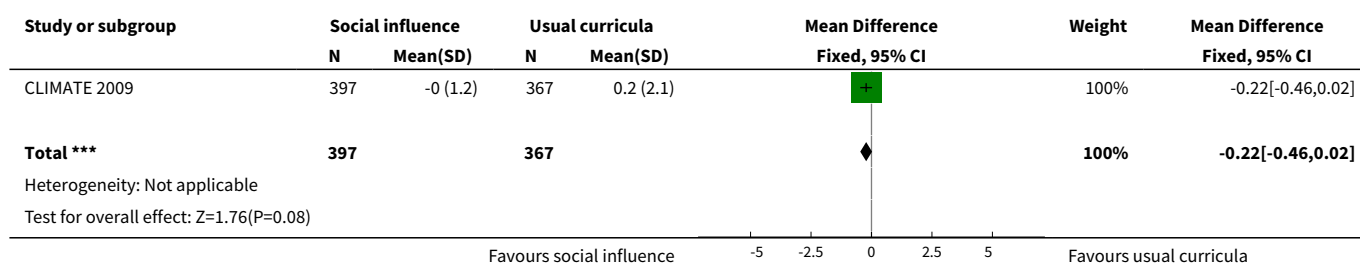
### Analysis 2.2. Comparison 2 Social influence versus usual curricula, Outcome 2 Marijuana use < 12 months.



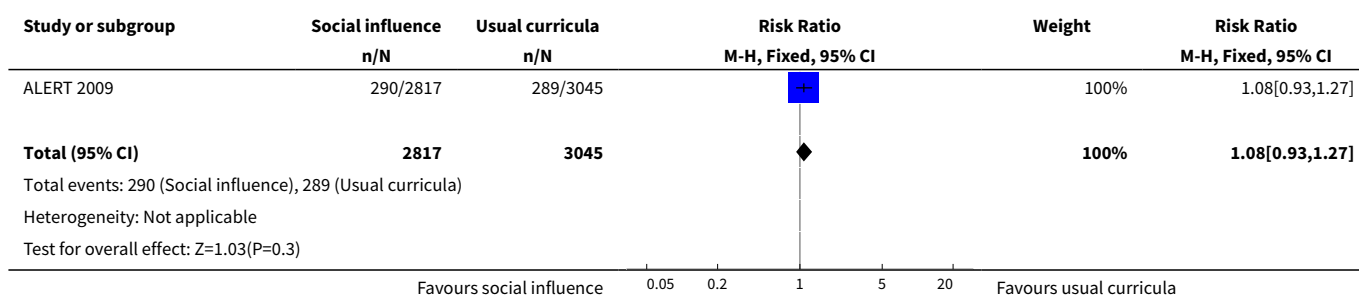
### Analysis 2.3. Comparison 2 Social influence versus usual curricula, Outcome 3 Marijuana use ≥ 12 months.



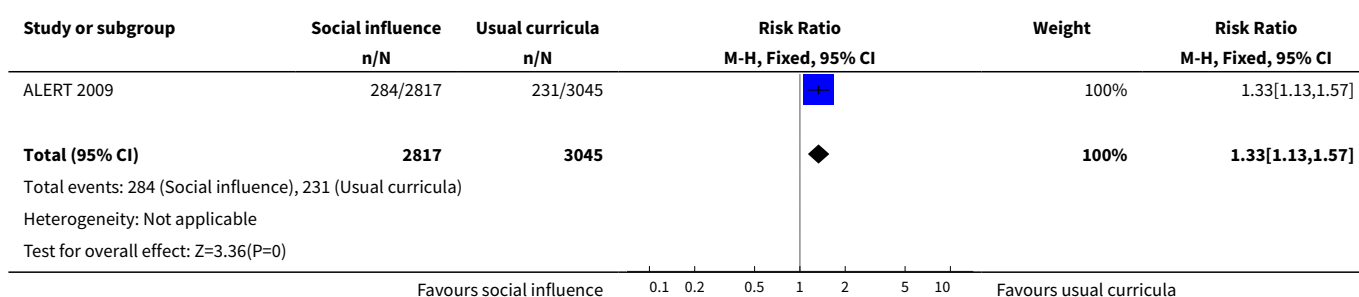
### Analysis 2.4. Comparison 2 Social influence versus usual curricula, Outcome 4 Marijuana use ≥12 months.



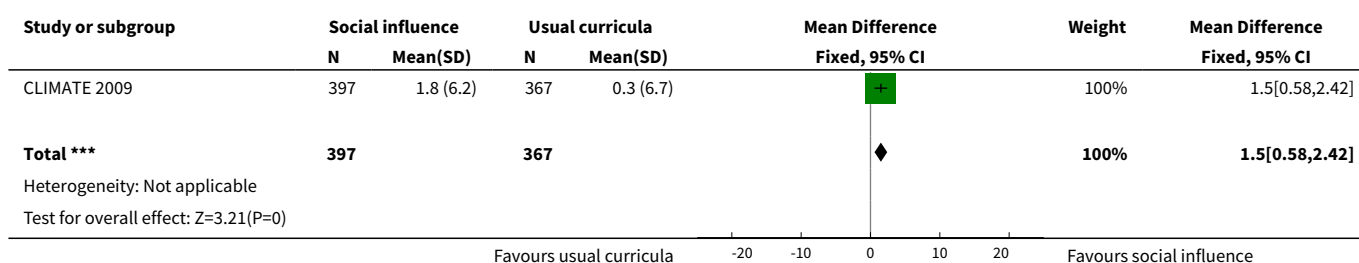
### Analysis 2.5. Comparison 2 Social influence versus usual curricula, Outcome 5 Other drug use < 12 months.



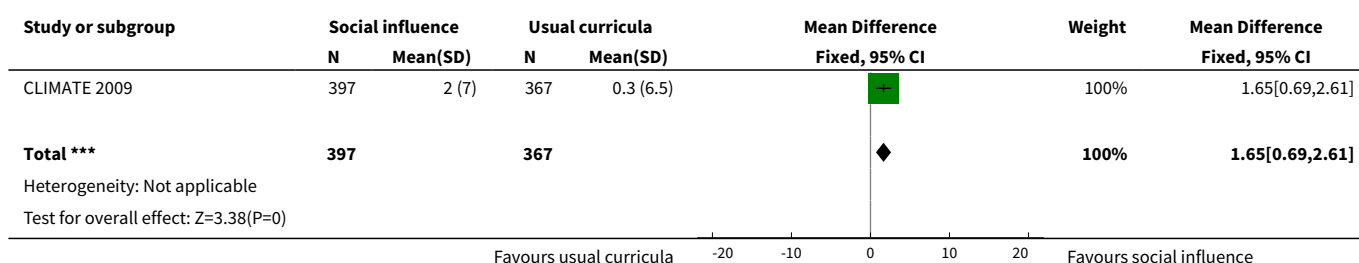
### Analysis 2.6. Comparison 2 Social influence versus usual curricula, Outcome 6 Other drugs use ≥ 12 months.



### Analysis 2.7. Comparison 2 Social influence versus usual curricula, Outcome 7 Drug knowledge < 12 months.



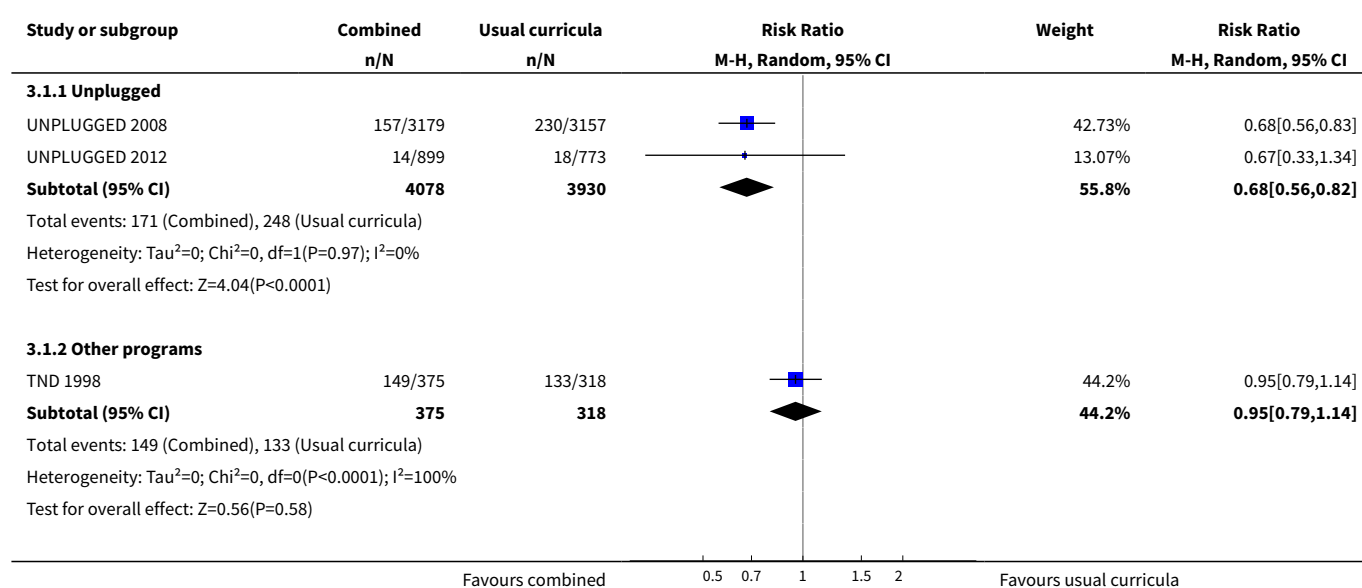
### Analysis 2.8. Comparison 2 Social influence versus usual curricula, Outcome 8 Drug knowledge ≥ 12 months.



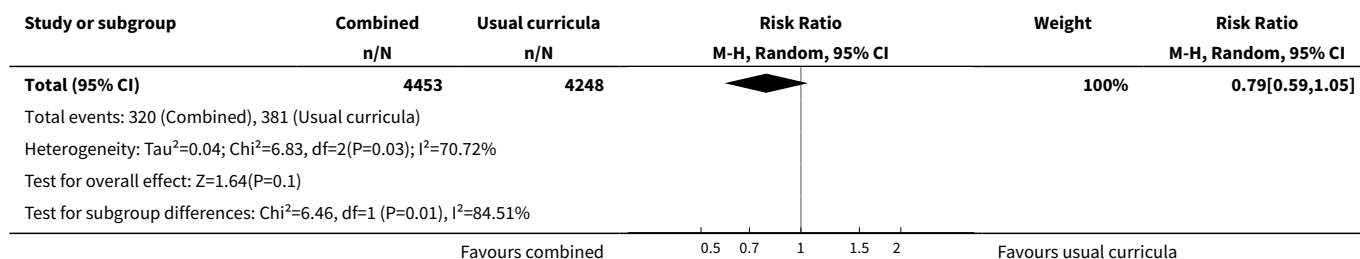
### Comparison 3. Combined versus usual curricula

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Marijuana use < 12 months	3	8701	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.59, 1.05]
1.1 Unplugged	2	8008	Risk Ratio (M-H, Random, 95% CI)	0.68 [0.56, 0.82]
1.2 Other programs	1	693	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.79, 1.14]
2 Marijuana use < 12 months	1	693	Mean Difference (IV, Fixed, 95% CI)	-1.90 [-5.83, 2.03]
3 Marijuana use ≥ 12 months	6	26910	Risk Ratio (M-H, Random, 95% CI)	0.83 [0.69, 0.99]
3.1 Unplugged	2	7321	Risk Ratio (M-H, Random, 95% CI)	0.47 [0.20, 1.11]
3.2 TND	3	2269	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.83, 1.09]
3.3 Other programmes	1	17320	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.89, 1.00]
4 Marijuana use ≥ 12 months	1	690	Mean Difference (IV, Fixed, 95% CI)	-0.80 [-4.39, 2.79]
5 Hard drug use < 12 months	1	693	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.63, 1.14]
6 Hard drug use < 12 months	1	693	Mean Difference (IV, Fixed, 95% CI)	-3.1 [-5.90, -0.30]
7 Hard drug use ≥ 12 months	2	1066	Risk Ratio (M-H, Random, 95% CI)	0.86 [0.39, 1.90]
8 Hard drug use ≥ 12 months	1	690	Mean Difference (IV, Fixed, 95% CI)	0.30 [-1.36, 1.96]
9 Any drugs use < 12 months	1	6362	Risk Ratio (M-H, Fixed, 95% CI)	0.76 [0.64, 0.89]

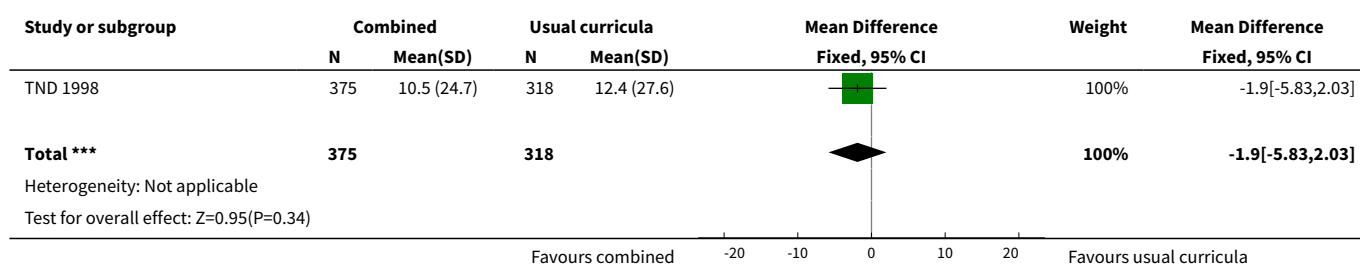
#### Analysis 3.1. Comparison 3 Combined versus usual curricula, Outcome 1 Marijuana use < 12 months.



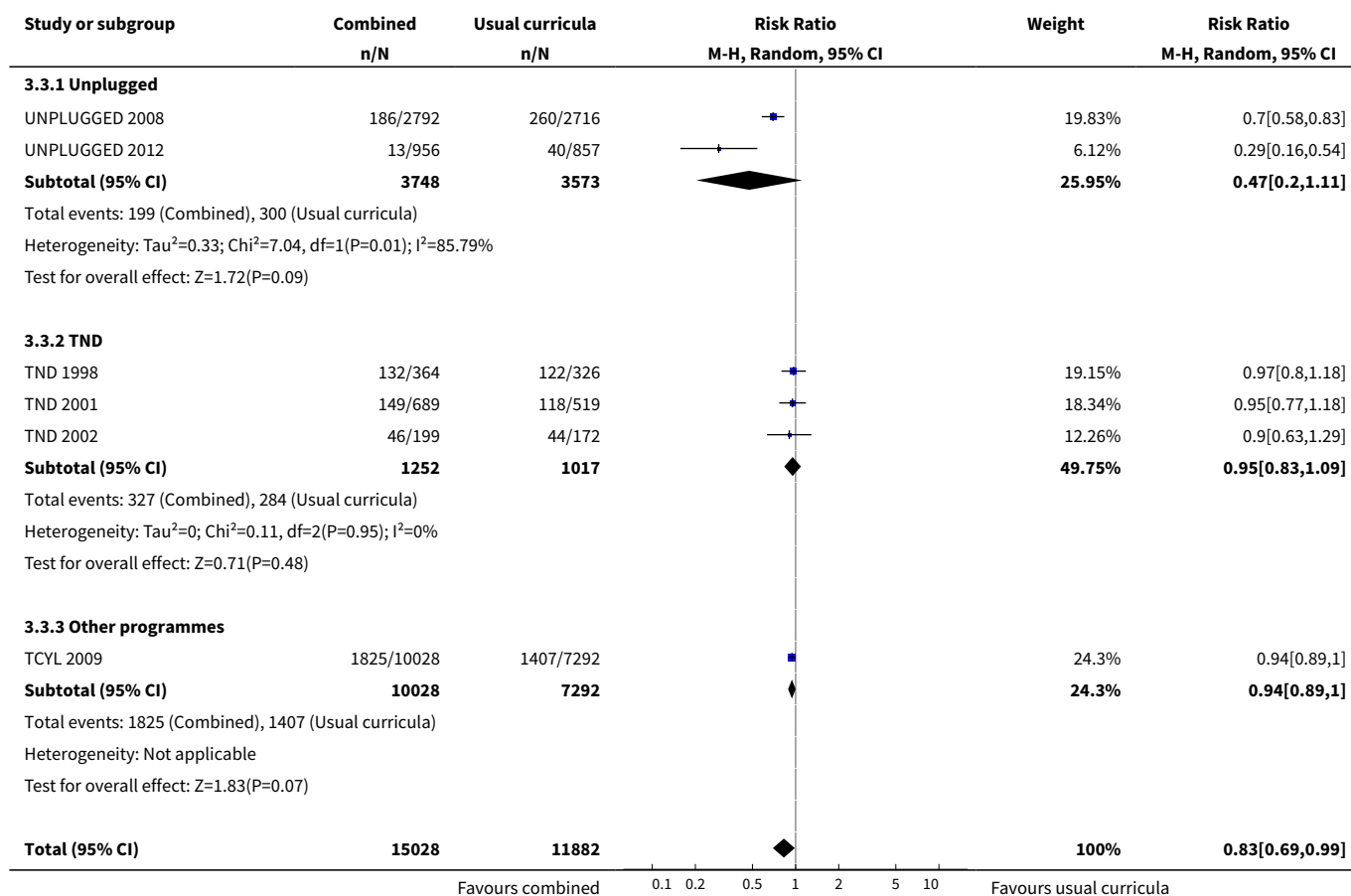


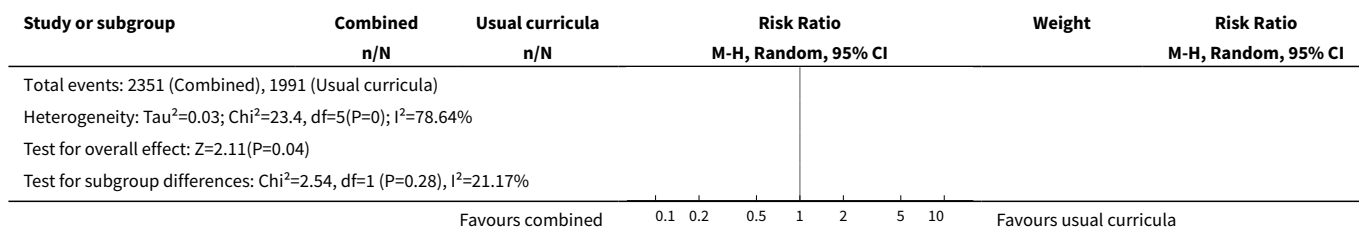


### Analysis 3.2. Comparison 3 Combined versus usual curricula, Outcome 2 Marijuana use < 12 months.

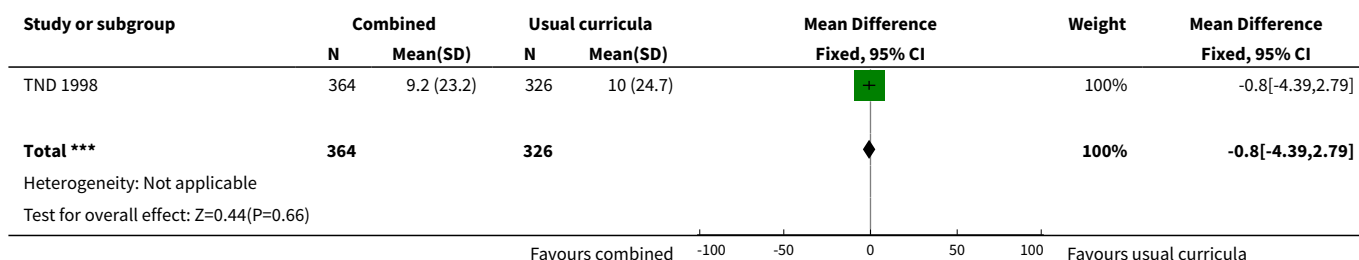


### Analysis 3.3. Comparison 3 Combined versus usual curricula, Outcome 3 Marijuana use ≥ 12 months.

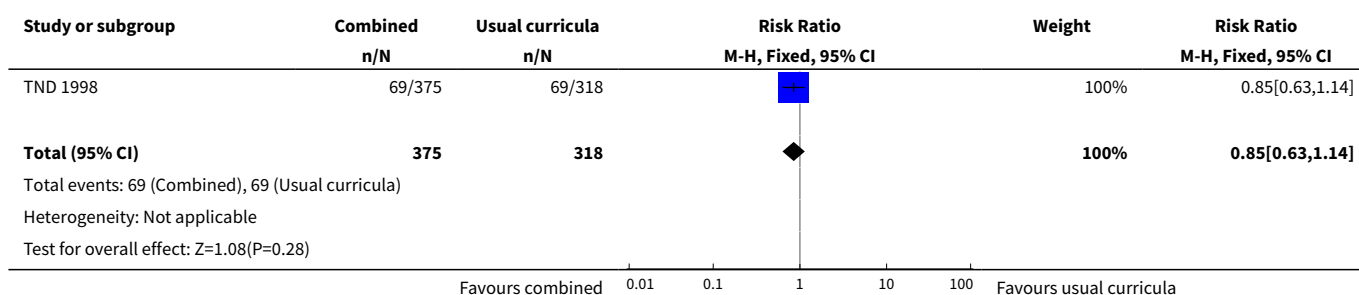




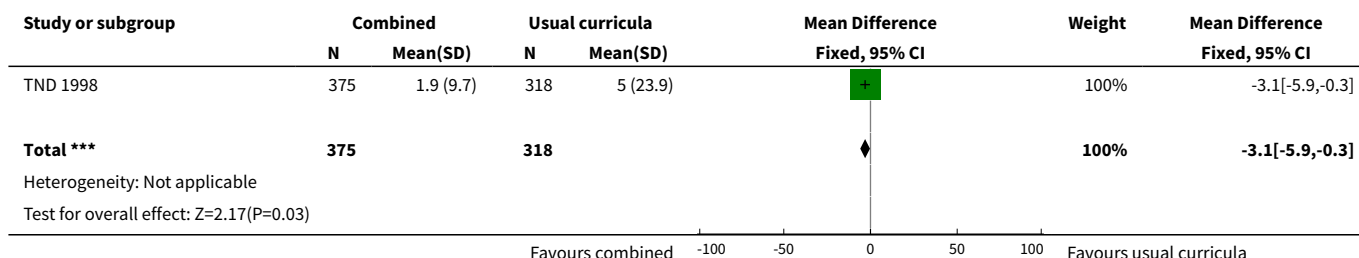
### Analysis 3.4. Comparison 3 Combined versus usual curricula, Outcome 4 Marijuana use $\geq 12$ months.



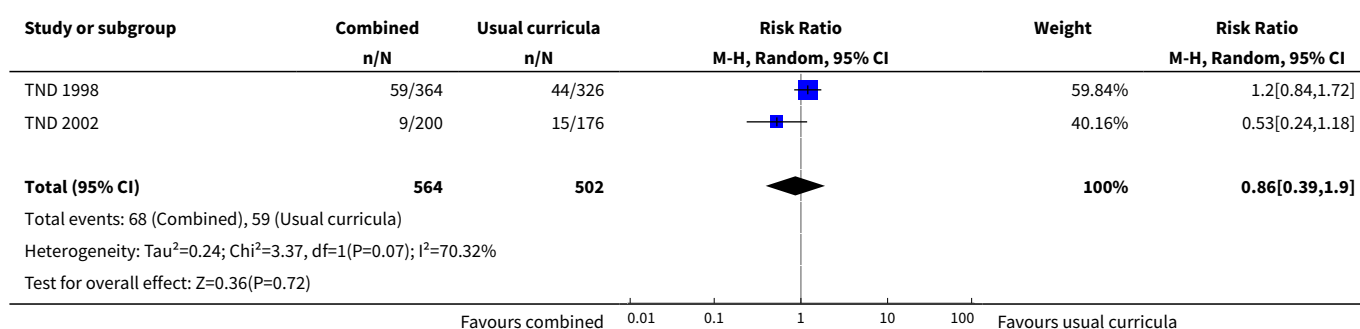
### Analysis 3.5. Comparison 3 Combined versus usual curricula, Outcome 5 Hard drug use < 12 months.



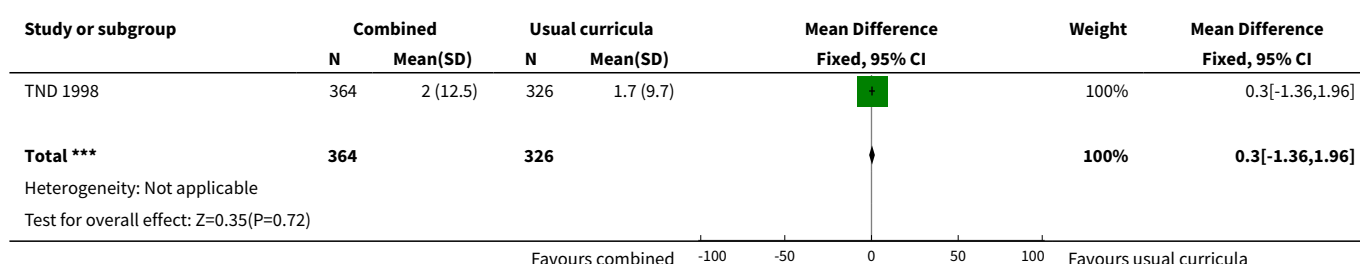
### Analysis 3.6. Comparison 3 Combined versus usual curricula, Outcome 6 Hard drug use < 12 months.



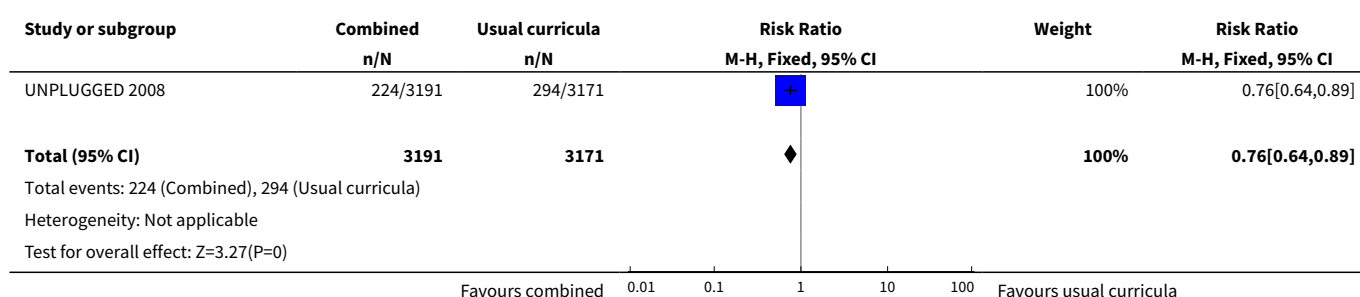
### Analysis 3.7. Comparison 3 Combined versus usual curricula, Outcome 7 Hard drug use $\geq 12$ months.



### Analysis 3.8. Comparison 3 Combined versus usual curricula, Outcome 8 Hard drug use $\geq 12$ months.



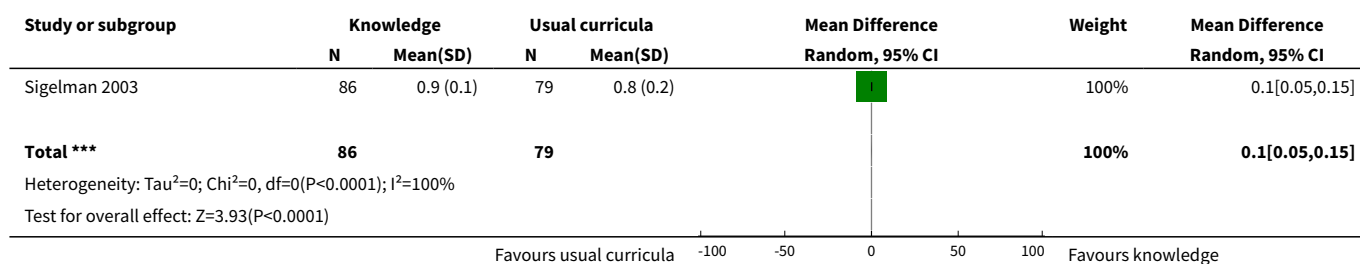
### Analysis 3.9. Comparison 3 Combined versus usual curricula, Outcome 9 Any drugs use $< 12$ months.



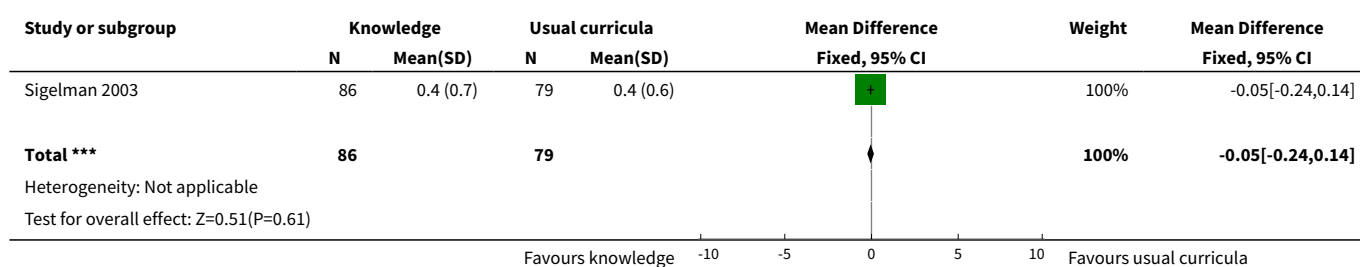
### Comparison 4. Knowledge versus usual curricula

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Drug knowledge $< 12$ months	1	165	Mean Difference (IV, Random, 95% CI)	0.10 [0.05, 0.15]
2 Intention to use hard drugs $< 12$ months	1	165	Mean Difference (IV, Fixed, 95% CI)	-0.05 [-0.24, 0.14]

### Analysis 4.1. Comparison 4 Knowledge versus usual curricula, Outcome 1 Drug knowledge < 12 months.



### Analysis 4.2. Comparison 4 Knowledge versus usual curricula, Outcome 2 Intention to use hard drugs < 12 months.



## ADDITIONAL TABLES

**Table 1. Results of studies not providing data for meta-analysis: social competence versus no intervention** (Continued)

Study reference	Pro-gramme name Study ID	Outcomes		
		Drug use	Intention to use	Knowledge
Clayton 1991-1996; Lynam 1999	DARE 1999	<b>Marijuana:</b> SFU favours controls, P value <= 0.05 LFU (2 years) trend in favour of controls, NS. (5- and 10-year follow-up), NS treatment effect	NA	NA
Perry 2003	DARE + DARE PLUS 2003	NA	<b>Marijuana:</b> SFU and LFU behaviour and intention: for boys, trend in favour of intervention, NS; for girls: NS  <b>Other drugs:</b> SFU and LFU behaviour and intention: for boys, favours treatment, P value < 0.05; for girls, NS	NA
	DARE 2003	NA	<b>Marijuana:</b> SFU and LFU behaviour and intentions: for boys, trend in	NA

**Table 1. Results of studies not providing data for meta-analysis: social competence versus no intervention** (Continued)

			favour of intervention, NS; for girls: NS	
			<b>Other drug:</b> <u>SFU</u> and <u>LFU</u> behaviour and intention: for boys, trend in favour of intervention, NS; for girls, NS	
Hecht 1993	DRS 1993	<b>Marijuana:</b> <u>SFU</u> favours intervention, NS  <b>Hard drugs:</b> <u>SFU</u> trend in favour of intervention, NS	NA	NA
Werch 1991	KACM 1991	NA	NA	<u>LFU</u> mean difference score = 0, NS.
Hecht 2003	KEEPIN' IT REAL 2003	<b>Marijuana:</b> <u>LFU</u> favours intervention: mean difference intervention-control = -0.175, P value <= 0.05	NA	NA
Elek 2010	KEEPIN' IT REAL 2010	<b>Any drug:</b> <u>SFU</u> (marijuana + legal substances): favours controls, P value <= 0.05	<b>Any drug:</b> <u>SFU</u> (marijuana + legal substances): trend in favour of intervention, NS	NA
	KEEPIN' IT REAL PLUS	<b>Any drug:</b> <u>SFU</u> (marijuana + legal substances), NS	<b>Any drug:</b> <u>SFU</u> (marijuana + legal substances), NS	NA
Botvin 1984	LST 1984	<b>Marijuana:</b> <u>SFU</u> proportion of students declaring monthly use: favours intervention (peer versus teacher, peer versus control); P value <= 0.05	NA	<b>Marijuana:</b> Favours intervention (peer versus control, teacher versus control, peer versus teacher); P value <= 0.05
Seal 2006	LST 2006	NA	NA	Favours treatment: mean knowledge score (SD); control = 10.4 (1.6), intervention = 16.5 (1.9), P value < 0.05
Moskovitz 1984	NAPA 1984	NA	NA	<u>SFU</u> no significant differences  <u>LFU</u> favours intervention

**Table 1. Results of studies not providing data for meta-analysis: social competence versus no intervention** (Continued)  
(males); P value ≤ 0.05

Shek 2012	PATHS 2012	<b>Any drug:</b> LFU favours treatment, P value ≤ 0.05	<b>Any drug:</b> LFU favours treatment, P value ≤ 0.05	NA
Cook 1984	PAY 1984	<b>Any drug:</b> LFU, NS  <b>Marijuana:</b> LFU, NS  <b>Hard drugs:</b> LFU, NS	NA	NA
Eisen 2002, Eisen 2003	SKILLS FOR ADOL 2002	<b>Marijuana:</b> SFU last 30 days use: 4.28% intervention versus 5.44% control; P value ≤ 0.05  <b>Other illicit substances:</b> SFU last 30 days use: 6.89% intervention versus 6.98% control, NS	NA	NA
		<b>Marijuana:</b> LFU last 30 days use: 11.32% intervention versus 13.79% control, NS <b>Other illicit substances:</b> LFU last 30 days use: 3.36% intervention versus 3.55% control, NS	<b>Marijuana:</b> LFU favours controls, NS  <b>Crack cocaine:</b> favours intervention, NS	NA
Hansen 1988	SMART 1988	<b>Marijuana:</b> SFU favours controls; P value ≤ 0.05  LFU favours controls; P value ≤ 0.05	NA	NA
Sexter 1984	Sexter 1984	<b>Marijuana:</b> SFU trend in favour of intervention, NS  <b>Other drugs:</b> SFU favours intervention, NS  <b>Hard drugs:</b> SFU, NS	NA	NA
Johnson 2009	THINK SMART 2009	<b>Marijuana:</b> LFU trend in favour of intervention, NS  <b>Other drugs:</b> LFU favours intervention; P value ≤ 0.05	NA	NA

P value ≤ 0.05: statistically significant

LFU: long-term follow-up (12+ months)

NA: outcome not assessed

NS: not statistically significant

SFU: short-term follow-up (&lt; 12 months)

**Table 2. Results of studies not providing data for meta-analysis: social influence versus no intervention** (Continued)

Study reference	Programme name Study ID	Outcomes		
		Drug use	Intention to use	Knowledge
Ellickson 1990	ALERT 2005  (Same intervention led either by adult educators only or adult assisted by teen leaders - versus control)	<b>Marijuana:</b> LFU favours intervention led by educators, but P value $\leq 0.05$ only for baseline marijuana and cigarette non-users	NA	NA
St Pierre 2005	ALERT 2005  (Intervention – adult led or adult led and teen assisted - versus control)	<b>Marijuana:</b> LFU, no differences between teacher led, teen assisted and control in past month; past year's use favours controls versus teen assisted intervention; P value $\leq 0.05$	<b>Marijuana:</b> LFU favours controls versus teen led programme, P value $\leq 0.05$	NA
Hansen 1988	SMART 1988	<b>Marijuana:</b> LFU trend in favour of intervention, NS	NA	NA
Sun 2008	TND arm A 2008	<b>Marijuana:</b> LFU trend in favour of controls, NS  <b>Hard drugs:</b> LFU favours treatment, P value $\leq 0.05$	NA	NA

P value  $\leq 0.05$ : statistically significant  
LFU: long-term follow-up (12+ months)  
NA: outcome not assessed  
NS: not statistically significant  
SFU: short-term follow-up (< 12 months)

**Table 3. Results of studies not providing data for meta-analysis: combined versus no intervention** (Continued)

Study reference	Programme name Study ID	Outcomes		
		Drug use	Intention to use	Knowledge
Dent 2001	TND 2001	<b>Hard drugs:</b> LFU favours treatment, P value $\leq 0.05$	NA	NA
Sun 2008	TND arm b 2008	<b>Marijuana:</b> LFU trend in favour of controls, NS  <b>Hard drugs:</b> LFU favours treatment, P value $\leq 0.05$	NA	NA

P value  $\leq 0.05$ : statistically significant  
LFU: long-term follow-up (12+ months)  
NA: outcome not assessed  
NS: not statistically significant  
SFU: short-term follow-up (< 12 months)

**Table 4. Results of studies not providing data for meta-analysis: knowledge versus no intervention** (Continued)

Study reference	Programme name Study ID	Outcomes		
		Drug use	Intention to use	Knowledge
Sexter 1984	Sexter 1984	<b>Marijuana:</b> <u>SFU</u> trend in favour of controls, NS  <b>Other drugs:</b> <u>SFU</u> trend in favour of controls, NS  <b>Hard drugs:</b> <u>LFU</u> trend in favour of intervention, NS	NA	NA

LFU: long-term follow-up (12+ months)

NA: outcome not assessed

NS: not statistically significant

SFU: short-term follow-up (&lt; 12 months)

**Table 5. Results of studies not providing data for meta-analysis: other programmes versus usual curricula** (Continued)

Study reference	Pro-gramme name Study ID	Comparison	Outcomes		
			Drug use	Intention to use	Knowledge
Berstein 1987	ASAP 1987	Trigger-based programme (visit to emergency department and detention centre) versus usual curricula	NA	NA	Consequences of drug use, NS
Furr Holden 2004	GOOD BEHAVIOR GAME (GBG) 2004	GBG (Classroom-centred intervention (CC) and Family-school partnership intervention) versus curricular intervention	<b>Marijuana:</b> <u>LFU</u> no evidence  <b>Hard drugs:</b> <u>LFU</u> favours CC with a reduced risk of starting to use illegal drugs other than marijuana (RR 0.32, P value <= 0.05)	NA	NA
Kellam 2012	GOOD BEHAVIOR GAME (GBG) 2012	GBG versus no intervention	<b>Drug abuse and dependence:</b> 15 years follow-up favours GBG among boys:  (19% GBG versus 38% controls, P value = 0.01)	NA	NA
Sexter 1984	Sexter 1984	Parent effectiveness model, network model versus no intervention	<b>Marijuana:</b> <u>SFU</u> : trend in favour of controls, NS  <b>Other drugs:</b> <u>SFU</u> trend in favour of treatment, NS  <b>Hard drugs:</b>	NA	NA



**Table 5. Results of studies not providing data for meta-analysis: other programmes versus usual curricula** (Continued)  
SFU trend in favour of controls, NS

P value  $\leq 0.05$ : statistically significant  
LFU: long-term follow-up (12+ months)  
NA: outcome not assessed  
NS: not statistically significant  
RR: risk ratio  
SFU: short-term follow-up (< 12 months)

**Table 6. Results of studies not providing data for meta-analysis: other comparisons** (Continued)

Study reference	Programme name Study ID	Comparison	Outcomes		
			Drug use	Intention to use	Knowledge
Malvin 1985	CROSS AGE TUTORING 1985	Other (students were taught tutoring and communication skills and tutored elementary students) versus other (same graders were taught business and interpersonal skills and operated an on-campus store)	NA	NA	SFU: NS LFU: NS
Botvin 1994	LST 1994	LST versus a culturally focused programme	NA	<b>Marijuana:</b> SFU, NS  <b>Other drugs:</b> SFU in favour of programme,  P value $\leq 0.05$	<b>Marijuana:</b> SFU: NS
McCambridge 2011	MOTIVATIONAL INTERVIEW (MI) 2011	Motivational interview versus knowledge	<b>Marijuana:</b> SFU favours control. Prevalence of use at 12 months MI = 20%, control = 15%; P value $\leq 0.05$	NA	NA
Werch 2011	PROJECT ACTIVE 2011	One-to-one consultation about physical activity versus a booklet	<b>Marijuana:</b> SFU favours treatment, NS	NA	NA
Werch 2005	PROJECT SPORT 2005	Brief consultation and in-person health behaviour screen versus wellness brochure	<b>Marijuana:</b> SFU favours treatment, NS	NA	NA
Jones 1995	REHEARSAL PLUS 1995	Skills-based programme versus general information	NA	NA	SFU in favour of treatment, P value $\leq 0.05$

**Table 6. Results of studies not providing data for meta-analysis: other comparisons** (Continued)

Hansen 1991	SMART 1991	Social competence versus social influence programmes	<b>Marijuana:</b> LFU favours social influence; P value $\leq 0.05$	NA	NA
Hansen 1991	SMART 1991	Social competence versus combined (social competence + social influence)	<b>Marijuana:</b> LFU in favour of combined; P value $\leq 0.05$	NA	NA
Hansen 1991	SMART 1991	Social influence versus combined (social competence + social influence)	<b>Marijuana:</b> LFU in favour of combined; P value $\leq 0.05$	NA	NA
Hansen 1991	SMART 1991	Social competence and social influence versus knowledge	<b>Marijuana:</b> LFU favours social influence versus knowledge; P value $< 0.05$ ; social competence versus knowledge, NS	NA	NA

P value  $\leq 0.05$ : statistically significant

LFU: long-term follow-up (12+ months)

MI: motivational interview

NA: outcome not assessed

NS: not statistically significant

SFU: short-term follow-up ( $< 12$  months)

**Table 7. Characteristics of intervention and outcome measures by type of comparison: social competence versus no intervention or usual curricula**

Study reference	Name of the programme Study ID	Duration (months)	N. of sessions	Deliverer	Time of outcome assessment (from programme end)	Drug use	Intention to use	Knowledge	Data for meta-analysis
Snow 1992	Adolescent Decision-Making (ADM 1992)	3	12	Not Reported	24 months	Marijuana, hard drugs	no	no	yes
Guo 2010	CMER 2010	3	6	Teacher	3 months	Any drug	no	yes	yes
Perry 2003	DARE 2003	10	10	Police officer	Post-test	Marijuana, any drug	no	no	no
Perry 2003	DARE + DARE plus 2003	4 + extra school activities	1	Police officer, teacher	Post-test	Marijuana, any drug	no	no	no
Ringwalt 1991	DARE 1991 b	4	17	Law officer	Post-test	Other drugs	no	no	yes
Clayton 1991	DARE 1991	4	Not Reported	Project staff	Post-test, 1 months, 2 months, 5 months and 10 years	Marijuana 30 days, past year	no	no	no
Hecht 1993	Drug Resistance Strategies (DRS 1993)	< 1	2	Project staff	Post-test	Marijuana, other drugs	yes	no	no

**Table 7. Characteristics of intervention and outcome measures by type of comparison: social competence versus no intervention or usual curricula** (Continued)

Bond 2004	GATEHOUSE 2004	3	20	Project staff	Post-test, 12, 24	Marijuana in the past 6 months	no	no	yes
Werch 1991	KACM 1991	1	4	Project staff, teacher	Post-test	Marijuana	yes	yes	no
Hecht 2003	KEEPIN'IT REAL 2003	18	10	Teacher	Post-test, 8 months, 14 months	Marijuana	no	no	no
Hecht 2008	KEEPIN'IT REAL 2008	18	12 + 3 - 6 boosters	Teacher	Post-test	Any drug	yes	no	yes
Elek 2010	KEEPIN'IT REAL 2010	18	15	Not Reported	12 months	Any drug	yes	no	no
Botvin 1984	LST 1984	24	20 (+ 10 boosters)	Teacher/peer	Post-test, 12 months	Marijuana 30 days	no	yes	no
Botvin 1990	LST 1990	36	15 (+ 15 boosters)	Teacher/project staff	Post-test, 36 months	Marijuana 30 days	no	no	yes
Botvin 2001	LST 2001	2 school years	15 + 10 boosters	Teacher	Post-test	Marijuana frequency, not clear in which period; other drugs, same as above	yes	yes	yes
Seal 2006	LST 2006	Not Reported	10	Not Reported	6 months	NR	no	yes	no
Resnicow 2008	LST and KEPT LEFT 2008	24	16 LST and 16 KEPT LEFT	Teacher	Post-test	Marijuana, hard drugs	no	no	yes

**Table 7. Characteristics of intervention and outcome measures by type of comparison: social competence versus no intervention or usual curricula** (Continued)

MOSKOVITZ 1984	NAPA 1984	4	12	Project staff	Post-test, follow-up (5 months)	no	no	yes	no
Shek 2012	PATHS 2012	36	120 (40 every school year)	Teacher and social worker	Process evaluation year 1 to 3 (wave 1 to 6). 3 and 12 months after the end (wave 7, 8)	Legal and illegal (ketamine, cannabis, ecstasy, heroine)	yes	no	no
Cook 1984	PAY 1984	6	48	Project staff/teacher	Post-test	Marijuana, hard drugs, other drugs	no	no	no
Beets 2009	POSITIVE ACTION 2009	60	700	Teacher	Post-test	Any drug lifetime use	no	no	yes
Hurry 1997	PROJECT CHARLIE 1997	12	40	Teacher	Post-test	no	yes	yes	yes
Corbin 1993	REHEARSAL PLUS	< 1	3	Psychology majors	Post-test, 3	no	no	yes	yes
Jones 1995	REHEARSAL PLUS	< 1	3	Undergraduate psychology majors	Post-test	no	no	yes	yes

**Table 7. Characteristics of intervention and outcome measures by type of comparison: social competence versus no intervention or usual curricula** (Continued)

Sexter 1984	Sexter 1984	6	Not Reported	Not Reported	6 months	Marijuana, other drugs	no	no	no
Eisen 2002	SKILLS FOR ADOL 2002	12	40	Teacher	12 months, 24 months	Marijuana, other drugs	no	no	no
Hansen 1988	SMART 1988	Not Reported	12	Project staff, teacher + peer	12 months, 24 months since programme beginning	Marijuana	no	no	no
Johnson 2009	THINK SMART 2009	6	15 (12 + 3 boosters)	Teacher	Post-test (wave 2), 6 m (wave 3)	Marijuana, other drugs	no	yes	no

m: months

**Table 8. Characteristics of interventions and outcome measures for type of comparison: social influence versus no intervention or usual curricula**

Study reference	Name of the program Study ID	Duration (months)	N. of sessions	Deliverer	Time of outcome assessment (from programme end)	Drug use	Intention to use	Knowledge	Data for meta-analysis
Ellickson 1990	ALERT 1990	2 school years	8 + 3 (boosters)	1. Educator + peer 2. Educator alone	Post-test, 3 months	Marijuana	yes	yes	no
Ellickson 2003	ALERT 2003	18	14	Teacher	Post-test	Marijuana	no	no	yes

**Table 8. Characteristics of interventions and outcome measures for type of comparison: social influence versus no intervention or usual curricula** (Continued)

St Pierre 2005	ALERT 2005	2 school years	14	Project staff + peer	Post-test, 12 months	Marijuana, 30 days use	no	no	no
Ringwalt 2009	ALERT 2009	2 school years	14	Teacher	Post-test, 12 months	Marijuana, 30 days use, Other drugs, 30 days use	no	no	yes
Copeland 2010	ATD 2010	18	Not Reported	Teacher	Post-test	Marijuana	no	no	yes
Newton 2009	CLIMATE 2009	6	12	Teacher	Post-test, 6 months, 12 months	Marijuana, 30 days use	no	yes	yes
Hansen 1988	SMART 1998	NR	12	Project staff, teacher + peer	12 months, 24 months from programme beginning	Marijuana	no	no	no
Sun 2008	TND 2008 Arm A	1	12	Project staff and teacher	12 months	Marijuana, 30 days use Hard drugs 30 days use	no	no	no

m: months

**Table 9. Characteristics of interventions and outcome measures for type of comparison: combined versus no intervention or usual curricula**

Study reference	Name of the programme Study ID	Duration (months)	N. of sessions	Deliverer	Time of outcome assessment (from programme end)	Drug use	Intention to use	Knowledge	Data for meta-analysis
Sloboda 2009	TCYL 2009	2 school years	10 + 7 (booster)	Project staff	24 months	Marijuana, 30 days	no	no	yes
Sussman 1998 and Sun 2006	TND 1998	1	9	Project staff	Post-test, 12, 48 months	Marijuana, 30 days Hard drugs, 30 days	no	no	yes
Dent 2001	TND 2001	1	9	Project staff	12 months	Marijuana, 30 days	no	no	yes
Sussman 2002	TND 2002	1	12	Project staff	24 months	Marijuana, 30 days	no	no	yes

**Table 9. Characteristics of interventions and outcome measures for type of comparison: combined versus no intervention or usual curricula** (Continued)

						Hard drugs, 30 days			
Sun 2008	TND 2008 Arm B	1	12	Project staff and teacher	12 months	Marijuana, 30 days Hard drugs, 30 days	no	no	no
Faggiano 2010	UNPLUGGED 2008	3	12	Teacher + peer	3 months, 12 months	Marijuana, 30 days Any drugs including marijuana	no	no	yes
Gabrhelik 2012	UNPLUGGED 2012	1 school year	12	Teacher	Post-test, 3moths, 12 months, 15 mnths, 24 months	Marijuana, 30 days  Lifetime any drugs use including marijuana	no	no	yes

**Table 10. Characteristics of interventions and outcome measures for type of comparison: knowledge versus no intervention or usual curricula**

Study reference	Name of the programme Study ID	Duration (months)	N. of sessions	Deliverer	Time of outcome assessment (from programme end)	Drug use	Intention to use	Knowledge	Data for meta-analysis
Sexter 1984	Sexter 1984	6	Not Reported	Not Reported	Post-test	Marijuana, other drugs	no	no	no
Sigelman 2003	Sigelman 2003	< 1	3	Project staff	Post-test	no	yes	yes	yes

**Table 11. Characteristics of interventions and outcome measures for type of comparison: other programmes versus no intervention or usual curricula**

Study reference	Name of the programme Study ID	Comparison	Duration (months): D N. of sessions: N	Deliverer	Time of outcome assessment (from programme end)	Drug use	Intention to use	Knowledge	Data for meta-analysis
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**Table 11. Characteristics of interventions and outcome measures for type of comparison: other programmes versus no intervention or usual curricula** (Continued)

Berstein 1987	ASAP 1987	Trigger-based programme (visit to emergency department and detention centre) versus usual curricula	D: 6 N: Not Reported	Project staff	Post-test, 8 months	Any drugs	no	yes	Meta-analysis not performed due to high heterogeneity
Furr Holden 2004	GOOD BEHAVIOR GAME (GBG) 2004	GBG versus curricular intervention	D: 12 N: Not Reported	Teacher	5 years, 6 years, 7 years	Marijuana, other drugs, hard drugs	no	no	Meta-analysis not performed due to high heterogeneity
Kellam 2012	GOOD BEHAVIOR GAME (GBG) 2012	GBG versus no intervention	D: 24 N: 3 times/week for 10 minutes, increasing in duration to 40 minutes	Trained teacher	15 years	CIDI-UM modified to reflect DSM-IV diagnostic criteria was used to determine the lifetime, past year and past month occurrence of drug abuse and dependence disorders	no	no	Meta-analysis not performed due to high heterogeneity
Sexter 1984	Sexter 1984	Parent effectiveness model, network model versus no intervention	D: 6 N: Not Reported	Not Reported	Post-test	Marijuana, other drugs	no	no	Meta-analysis not performed due to high heterogeneity

CIDI-UM: Composite International Diagnostic Interview - University of Michigan (scale for occurrence of drug abuse and dependence disorders)  
 DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th Edition

**Table 12. Characteristics of intervention and outcome measures by type of comparison: other comparisons**

Study reference	Name of the programme Study ID	Comparison	Duration (months): D Number of sessions: N	Deliverer	Time of outcome assessment (from programme end)	Drug use	In-cluded for meta-analysis Dated tendedge tion to use	Meta-analysis not performed due to high heterogeneity
Malvin 1985	CROSS AGE	Other (students were taught tutoring and communication skills and tutored elementary students)	D: 6	Project staff	Post-test, 12 months	Any drug	no	Meta-analysis not performed due to high heterogeneity

**Table 12. Characteristics of intervention and outcome measures by type of comparison: other comparisons** (Continued)

		TU- versus other (same graders were taught business skills and personal skills and operated an on-campus store)	STORING/STORE	N: Not Reported					
Botvin 1994	LST 1994	LST versus a culturally focused programme		D: 7 N: 15	Project staff + peer	Post-test, 18 months	no	yes	Meta-analysis not performed due to high heterogeneity
Mc-Cam-bridge 2011	MOTIVATIONAL INTERVIEW	Motivational interview versus knowledge		D: 1 hour N: 1	Not reported	3 months, 12 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Hansen 1991	SMART 1991	Social competence versus social influence programmes		D: Not Reported N: 9	Project staff	12 months, 24 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Hansen 1991	SMART 1991	Social competence versus combined (social competence + social influence)		D: Not Reported N: 9	Project staff	12 months, 24 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Hansen 1991	SMART 1991	Social influence versus combined (social competence + social influence)		D: Not Reported N: 9	Project staff	12 months, 24 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Hansen 1991	SMART 1991	Social competence and social influence versus knowledge		D: Not Reported N: Not Reported	Project staff	12 months, 24 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Werch 2011	PROJECT ACTIVE 2011	One-to-one consultation about physical activity versus a booklet		D: 1 day N: 1	Not reported	3 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity
Werch 2005	PROJECT SPORT 2005	Brief consultation and in-person health behaviour screen versus wellness brochure		D: 1 day N: 1	Project staff	3 months, 12 months	Mar-i-jua-na	no	Meta-analysis not performed due to high heterogeneity

**Table 12. Characteristics of intervention and outcome measures by type of comparison: other comparisons** *(Continued)*

Jones 1990	RE-HEARSAL PLUS 1990	Skills-based programme versus general information	D: 2 days N: 2	Project staff	Post-test	no	no	yes	Meta-analysis not performed due to high heterogeneity
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LST: Life Skill Training

## APPENDICES

### Appendix 1. Cochrane Drugs and Alcohol Group's Trials Register search strategy

#1 MeSH DESCRIPTOR Primary Prevention

#2 MeSH DESCRIPTOR Health Education

#3 MeSH DESCRIPTOR Counseling

#4 MeSH DESCRIPTOR Adaptation, Physiological

#5 MeSH DESCRIPTOR Interpersonal

#6 MeSH DESCRIPTOR Social Adjustment

#7 ((educat\* OR prevent\* OR counsel\* OR skill\*):ti,ab,kw,xin)

#8 ((peer\* NEXT group\*):ti,ab,kw,xin)

#9 (school\*:xin)

#10 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9

#11 ((adolescen\* OR teenage\* OR young OR student\* OR juvenile OR kid OR kids OR youth OR underage OR school\* OR class\*):ti,ab,kw,xdi,xin)

#12 #10 AND #11

### Appendix 2. CENTRAL search strategy

#1 MeSH descriptor: [Substance-Related Disorders] explode all trees

#2 abus\*:ti,ab,kw OR addict\*:ti,ab,kw OR use\*:ti,ab,kw

#3 #1 or #2

#4 drug\*:ti,ab,kw OR substance:ti,ab,kw

#5 cannabis:ti,ab,kw

#6 marijuana OR marihuana OR hashish

#7 MeSH descriptor: [Morphine] explode all trees

#8 heroin

#9 MeSH descriptor: [N-Methyl-3,4-methylenedioxymphetamine] explode all trees

#10 ecstasy

#11 MDMA

#12 MeSH descriptor: [Hallucinogens] explode all trees

#13 hallucinogen\*

#14 MeSH descriptor: [Cocaine] explode all trees

#15 cocaine\*

#16 MeSH descriptor: [Lysergic Acid] explode all trees

#17 lysergic near acid

#18 lsd:ti,ab,kw

#19 MeSH descriptor: [Designer Drugs] explode all trees

#20 designer next drugs

#21 #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20

#22 #3 and #21

#23 MeSH descriptor: [Centers for Disease Control and Prevention (U.S.)] explode all trees

#24 MeSH descriptor: [Primary Prevention] explode all trees

#25 prevent\*:ti,ab,kw

#26 Health Education:ti,ab,kw

#27 MeSH descriptor: [Health Education] explode all trees

#28 education:ti,ab,kw

#29 MeSH descriptor: [Counseling] explode all trees

#30 MeSH descriptor: [Peer Group] explode all trees

#31 peer group:ti,ab,kw

#32 MeSH descriptor: [Activities of Daily Living] explode all trees

#33 MeSH descriptor: [Adaptation, Physiological] explode all trees

#34 MeSH descriptor: [Adolescent Psychology] explode all trees

#35 MeSH descriptor: [Interpersonal Relations] explode all trees

#36 MeSH descriptor: [Social Adjustment] explode all trees

#37 life near skill\*

#38 counsel\*:ti,ab,kw

#39 #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38

#40 #22 and #39

#41 adolescen\*:ti,ab,kw OR teenage\*:ti,ab,kw OR young:ti,ab,kw OR student\*:ti,ab,kw OR juvenile:ti,ab,kw

#42 child\*:ti,ab,kw OR school\*:ti,ab,kw OR class\*:ti,ab,kw

#43 #41 and #42

#44 #40 and #43

### Appendix 3. PubMed search strategy

#1 Substance-Related Disorders[MeSH]

#2 abuse\*[tiab] OR use\*[tiab] OR depend\*[tiab] OR addict\*[tiab]

#3 drug\*[tiab] OR substance[tiab] OR Cannabis[MeSH] OR N-Methyl-3,4-methylenedioxymphetamine[MeSH] OR ecstasy[tiab] OR MDMA[tiab] OR "Hallucinogens"[MeSH] OR hallucinogen\*[tiab] OR cocaine[tiab] OR cocaine[MeSH] OR "Lysergic Acid Diethylamide"[MeSH] OR LSD[tiab] OR heroin[tiab] OR morphine[tiab] OR Heroin[MeSH]

#4 #2 AND #3

#5 #1 OR #4

#6 "Centers for Disease Control and Prevention (U.S.)"[MeSH] OR Primary Prevention[MeSH] OR "Health Education"[MeSH] OR counselling[MeSH] OR counsel\*[tiab] OR educat\*[tiab] OR skill\*[tiab] OR prevent\*[tiab] OR "Peer Group"[MeSH] OR "Peer Group"[tiab] OR "Activities of Daily Living"[MeSH] OR "Adaptation, Psychological"[MeSH] OR "Adolescent Psychology"[MeSH] OR "Interpersonal Relations"[MeSH] OR "Social Adjustment"[MeSH]

#7 adolescen\*[tiab] OR teenage\*[tiab] OR young[tiab] OR student\*[tiab] OR juvenile[tiab] OR child\*[tiab] OR school\*[tiab] OR Adolescent[MeSH] OR Child[MesSH]

#8 #5 AND #6 AND #7

#9 randomized controlled trial[pt]

#10 controlled clinical trial[pt]

#11 randomized[tiab]

#12 drug therapy[sh]

#13 randomly[tiab]

#14 trial[tiab]

#15 groups[tiab]

#16 (animals[mh] NOT humans[mh]))

#17 #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14

#18 #15 NOT #14

#19 #8 AND #18

#### Appendix 4. EMBASE search strategy

'illicit drug'/exp OR 'drug abuse'/exp OR 'substance abuse'/exp OR (substance:ab,ti AND (addict\*:ab,ti OR abus\*:ab,ti OR use\*:ab,ti)) OR (drug\*:ab,ti AND (addict\*:ab,ti OR abus\*:ab,ti)) OR (drug NEAR/3 use\*):ab,ti OR (addict\*:ab,ti OR abuse\*:ab,ti OR (use\*:ab,ti AND (disorder\*:ab,ti OR illicit:ab,ti)) AND ('morphine'/exp OR morphine:ab,ti OR 'diamorphine'/exp OR heroin:ab,ti OR 'cannabis'/exp OR cannabis:ab,ti OR marijuana:ab,ti OR marihuana:ab,ti OR hashish:ab,ti OR 'psychedelic agent'/exp OR ecstasy:ab,ti OR mdma:ab,ti OR hallucinogen\*:ab,ti OR lsd:ab,ti OR 'cocaine'/exp OR cocaine:ab,ti)) AND ('prevention and control'/exp OR 'education program'/exp OR 'health education'/exp OR 'counseling'/exp OR 'health program'/exp OR 'social behavior'/exp OR 'peer group':ab,ti OR educat\*:ab,ti OR prevent\*:ab,ti OR counsel\*:ab,ti OR skill\* OR 'daily life activity'/exp) AND ('adolescent'/exp OR 'child'/exp OR adolescen\*:ab,ti OR teenage\*:ab,ti OR young:ab,ti OR student\*:ab,ti OR juvenile:ab,ti OR child\*:ab,ti OR school\*:ab,ti) AND ('crossover procedure'/exp OR 'double blind procedure'/exp OR 'single blind procedure'/exp OR 'controlled clinical trial'/exp OR 'clinical trial'/exp OR 'randomized controlled trial'/exp OR placebo:ab,ti OR 'double blind':ab,ti OR 'single blind':ab,ti OR assign\*:ab,ti OR allocat\*:ab,ti OR volunteer\*:ab,ti OR random\*:ab,ti OR factorial\*:ab,ti OR crossover:ab,ti OR (cross:ab,ti AND over:ab,ti)) AND [embase]/lim

#### Appendix 5. PsycINFO search strategy

S1 DE "Drug Abuse" OR DE "Drug Dependency" OR DE "Inhalant Abuse" OR DE "Polydrug Abuse"

S2 TX((drug\* or substance\* or narcotic\* or heroin or opiate\* or opioid\* opium or cocaine\* or cannabis\* or marijuana o marihuana or hashis or phencyclidine or benzodiaz\* or barbiturate\* or amphetamine\* or MDMA or hallucinogen\* or ketamine or lsd or inhalant\* or drug\* or substance\*) N5 (use ore misuse or abuse\* or addict\* or depend\* or disorder\*))

S3 S1 OR S2

S4 DE "Drug Abuse Prevention"

S5 DE "Health Education" OR DE "Drug Education"

S6 DE "School Based Intervention"

S7 DE "Counseling" OR DE "Educational Counseling" OR DE "Peer Counseling" OR DE "School Counseling"

S8 DE "Activities of Daily Living"

S9 DE "Adolescent Psychology"

S10 DE "Interpersonal Relationship"

S11 DE "Social Adjustment"

S12 TI((counsel\* or educat\* or skill \* or pevent\* or "peer group")) OR AB((counsel\* or educat\* or skill \* or pevent\* or "peer group"))

S13 S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12

S14 child\* or boy\* or girl\* or schoolchild\* or juvenile\* or minor\* or teen\* or adolescen\* or youth\* or young\* people

S15 ZG “adolescence (13-17 yrs)” or (ZG “schoolage (6-12 yrs)”)

S16 S14 OR S15

S17 DE “Clinical Trials”

S18 TX random\*

S19 TX clinical N3 trial\*

S20 TX research N3 design

S21 TX evaluat\* N3 stud\*

S22 TX prospective\* N3 stud\*

S23 TX ((singl\* or doubl\* or trebl\* or tripl\*) N3 (blind\* or mask\* or dummy))

S24 S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23

S25 PO (animal not human)

S26 S24 NOT S25

S27 S3 AND S13 AND S16 AND S26

## Appendix 6. ERIC search strategy

Thesaurus organised strategy, referring to substances of abuse and to interventions.

## Appendix 7. SOCIOLOGICAL ABSTRACTS search strategy

Search for substances of abuse and interventions: generic terms (DRUG ABUSE, DRUG ADDICTION, DRUG DEPENDENCE) were employed because specific substance names could not be used.

## Appendix 8. Criteria for risk of bias in RCTs and CCTs

	Item	Judgement	Description
1	Random sequence generation (selection bias)	Low risk	The investigators describe a random component in the sequence generation process such as: random number table; computer random number generator; coin tossing; shuffling cards or envelopes; throwing dice; drawing of lots; minimisation
		High risk	The investigators describe a non-random component in the sequence generation process such as: odd or even date of birth; date (or day) of admission; hospital or clinic record number; alternation; judgement of the clinician; results of a laboratory test or a series of tests; availability of the intervention
		Unclear risk	Insufficient information about the sequence generation process to permit judgement of Yes or No
2	Allocation concealment (selection bias)	Low risk	Investigators enrolling participants could not foresee assignment because one of the following, or an equivalent method, was used to conceal allocation: central allocation (including telephone, web-based and pharmacy-controlled, randomisation); sequentially numbered drug containers of identical appearance; sequentially numbered, opaque, sealed envelopes

(Continued)

		High risk	Investigators enrolling participants could possibly foresee assignments because one of the following method was used: open random allocation schedule (e.g. a list of random numbers); assignment envelopes without appropriate safeguards (e.g. if envelopes were unsealed or nonopaque or not sequentially numbered); alternation or rotation; date of birth; case record number; any other explicitly unconcealed procedure
		Unclear risk	Insufficient information to permit judgement of Yes or No. This is usually the case if the method of concealment is not described or not described in sufficient detail to allow a definite judgement
3	Blinding of outcome assessor (detection bias)  Subjective outcomes	Low risk	Blinding of outcome assessor and unlikely that the blinding could have been broken (e.g. questionnaires were compiled by participants using an anonym code and in a manner that ensured privacy without access by teachers, parents or project staff)
		High risk	No blinding or incomplete blinding of outcome assessor (e.g. outcomes assessed by interview made by projects staff or by non-anonymous questionnaires)  Blinding of outcome assessor attempted, but likely that the blinding could have been broken
		Unclear risk	Insufficient information to permit judgement of Yes or No
4	Incomplete outcome data (attrition bias)  For all outcomes except retention in treatment or drop-out	Low risk	No missing outcome data  Reasons for missing outcome data unlikely to be related to true outcome  Missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups  For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk not enough to have a clinically relevant impact on the intervention effect estimate  For continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes not enough to have a clinically relevant impact on observed effect size  Missing data have been imputed using appropriate methods  All randomised patients are reported/analysed in the group they were allocated to by randomisation irrespective of non-compliance and co-interventions (intention-to-treat)
		High risk	Reason for missing outcome data likely to be related to true outcome, with either imbalance in numbers or reasons for missing data across intervention groups  For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk enough to induce clinically relevant bias in intervention effect estimate  For continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes enough to induce clinically relevant bias in observed effect size  As-treated analysis done with substantial departure of the intervention received from that assigned at randomisation



(Continued)

		Unclear risk	Insufficient reporting of attrition/exclusions to permit judgement of Yes or No (e.g. number randomised not stated, no reasons for missing data provided; number of drop-outs not reported for each group)
5	Similarity of groups at baseline	Yes	Groups similar at baseline for the main socio-demographic characteristics as well as for drugs and alcohol use at baseline  Groups not similar at baseline for some characteristics but adjustment for imbalance was done during the analysis using appropriate methods
		No	Groups not similar at baseline for some characteristics and adjustment for imbalance was not done during the analysis using appropriate methods
		Unclear	Insufficient information to permit judgement of Yes or No

## WHAT'S NEW

Date	Event	Description
17 August 2017	Amended	Incorrect statement: "Another important observation is that some programmes showed adverse effects, for example a significant increase in the use of marijuana (CLIMATE 2009)". Replaced with the sentence: "Another important observation is that some programmes showed adverse effects, for example a significant increase in the use of marijuana in the affective strategy of Smart Program (SMART 1988), or in the use of other drugs (ALERT 2009); this has also happened for more recent programmes, although only for tobacco use and binge drinking (TCYL 2009)."  Further amendments are underway. See <a href="#">Published notes</a> for details.

## HISTORY

Protocol first published: Issue 2, 2001

Review first published: Issue 2, 2005

Date	Event	Description
25 January 2016	Amended	Eternal source of support information added
29 October 2014	New citation required and conclusions have changed	We added 22 new studies to the 29 studies included in the original review. Substantial revisions included revised 'Risk of bias' assessment and assessment of publication bias.
24 September 2014	New search has been performed	Literature search updated to September 2013.

## CONTRIBUTIONS OF AUTHORS

As for the first version of this review, FF, Patrizia Lemma and EV conceptualised the review; Federica Vigna-Taglianti, Alessio Zambon and EV performed the literature searches and organised paper collection. FV-T, FF, Alberto Borraccino, AZ and EV reviewed the papers. FV-T, FF

and EV abstracted data from the papers for meta-analysis. FF wrote the introduction, results, discussion and conclusions sections. FV-T wrote the methods, description of studies and methodological quality of included studies sections. EV wrote the abstract and helped to complete the review. All authors provided comments on the final version.

For the update FF and EV selected the studies for inclusion. SM, DB and EV extracted data from studies. FF and DB updated the introduction. SM performed meta-analysis and wrote the methods and results sections of the review. EV wrote the abstract and the plain language summary. FF wrote the discussion and the conclusions. All authors provided comments on the final version.

## DECLARATIONS OF INTEREST

FF is an author of an included study ([UNPLUGGED 2008](#)). He did not participate in the evaluation of and data extraction for the related papers.

SM EV,DB have no conflicts of interest

## SOURCES OF SUPPORT

### Internal sources

- No sources of support supplied

### External sources

- For the original version: National Fund Against Drug - 1996 - Piedmont Region grant No. 239/28.1, Italy.
- For the 2014 update: European Community's Seventh Framework Programme (FP7/2007-2013), under Grant Agreement n. 266813- Addictions and Lifestyle in Contemporary Europe-Reframing Addictions Project (ALICE RAP). Participant organizations in ALICE RAP can be seen at <http://www.alicerap.eu/about-alice-rap/partners.html>. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript, Other.

## DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The following changes have been made in the present update, compared with the previous version:

1. We have excluded observational studies because a large number of RCTs were retrieved in the update.
2. We changed the classification of the types of programmes, adopting the system proposed by Thomas ([Thomas 2013](#)), as explained in the background section.
3. We no longer considered intermediate outcomes (attitudes toward drugs, acquirement of personal skills) and other less relevant secondary outcomes (peer/adult drug use, other changes in behaviours).

## NOTES

The correction has been made to address concerns from the lead author of the study CLIMATE 2009 about the incorrect reporting of the results.

Further amendments are underway to address the inconsistencies in reporting, interpretation of results and GRADE quality ratings identified by Central Editorial Unit.

## INDEX TERMS

### Medical Subject Headings (MeSH)

\*School Health Services; Controlled Clinical Trials as Topic; Marijuana Abuse [prevention & control]; Program Evaluation; Randomized Controlled Trials as Topic; Substance-Related Disorders [\*prevention & control]

### MeSH check words

Adolescent; Humans